Fig. 1

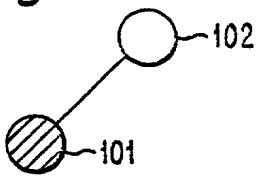


Fig. 2

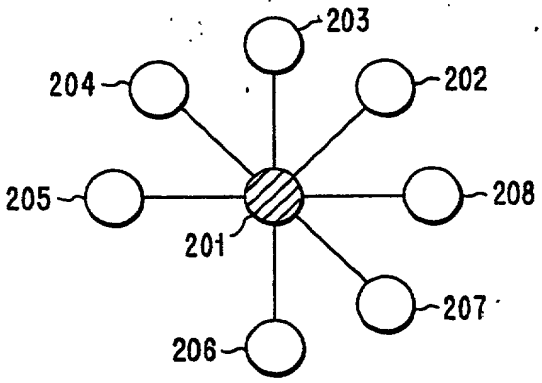
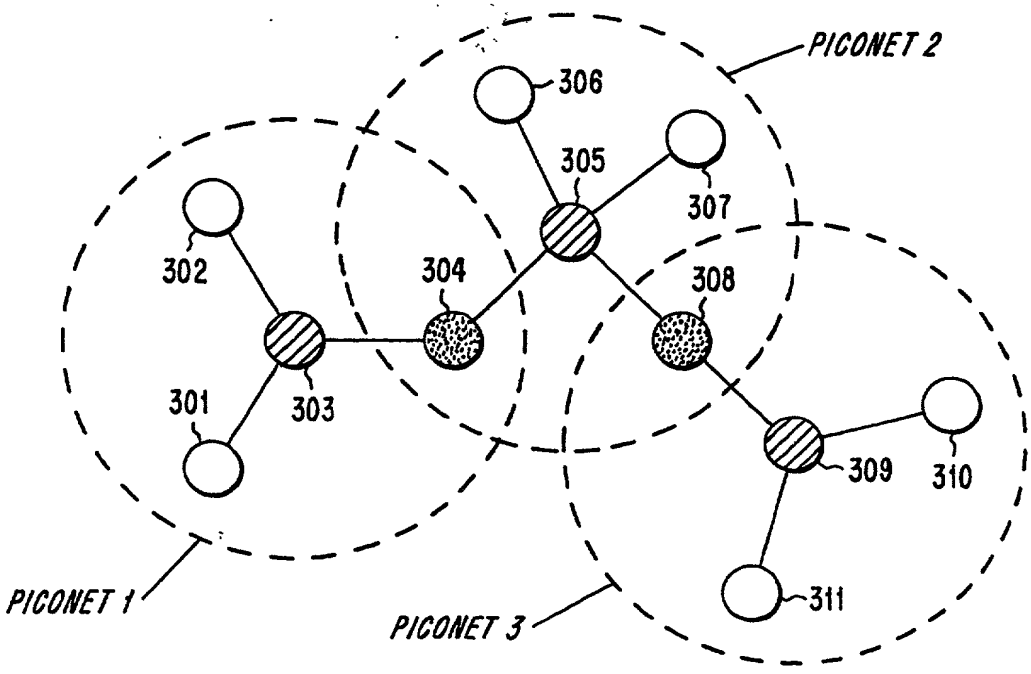


Fig. 3



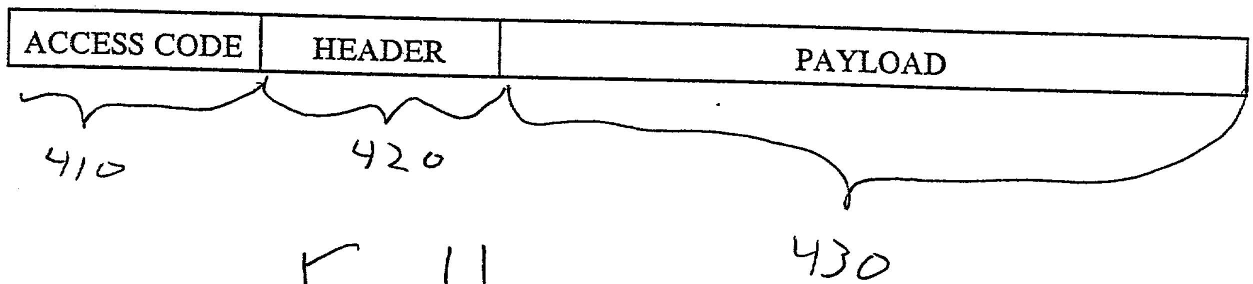


Fig 4

040000-154

Fig 5

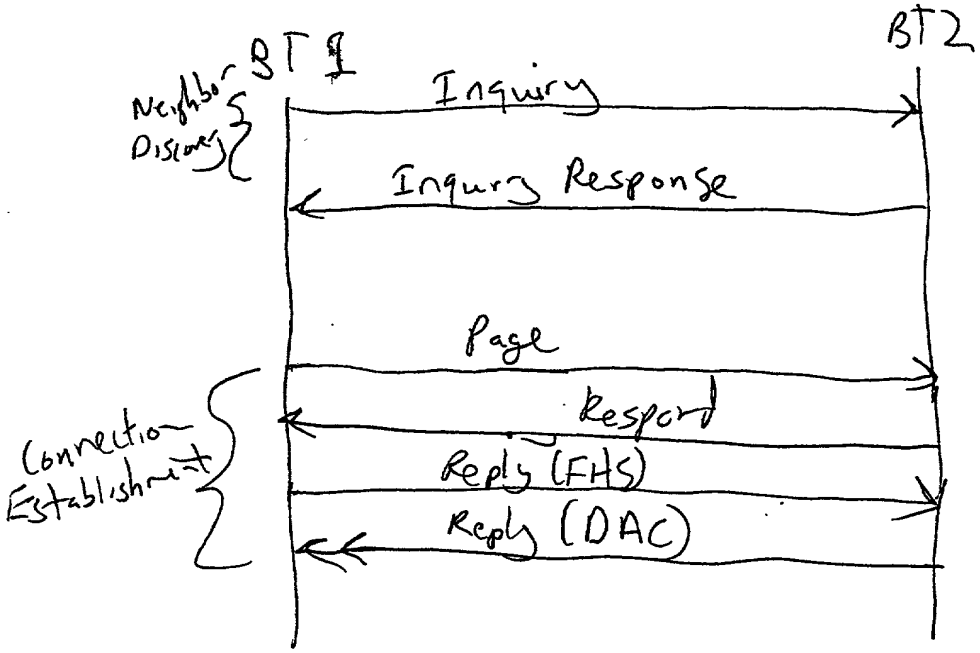


Fig 5

PARITY BITS	LAP	Undefined	SR	SP	UAP	NAP	Class of device	AM_ ADDR	CLK	Page scan mode

Fig 6

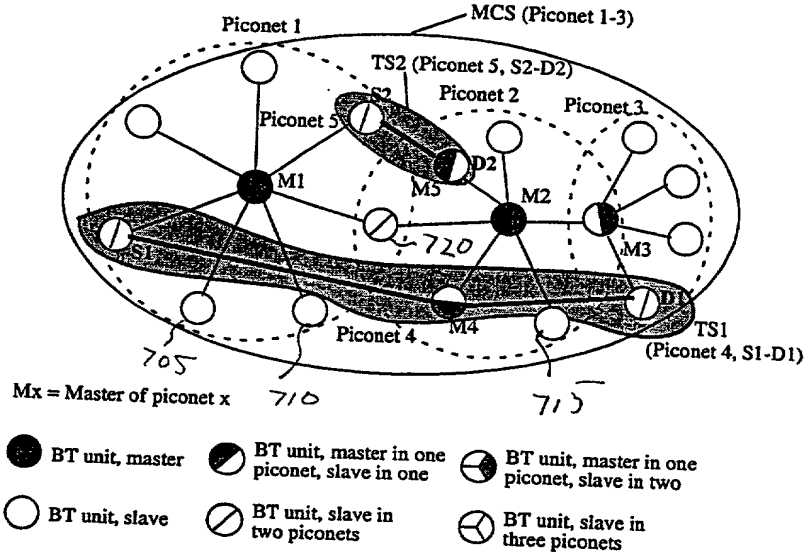

Piconet 1
MCS (Piconet 1-3)
TS2 (Piconet 5, S2-D2)
S2
Piconet 2
Piconet 3
Piconet 5
D2
M1
M5
M2
720
S1
M3
D1
TS1
(Piconet 4, S1-D1)
Piconet 4
M4
705
710
715
Mx = Master of piconet x
BT unit, master
BT unit, master in one piconet, slave in one
BT unit, master in one piconet, slave in two
BT unit, slave
BT unit, slave in two piconets
BT unit, slave in three piconets

Fig 7

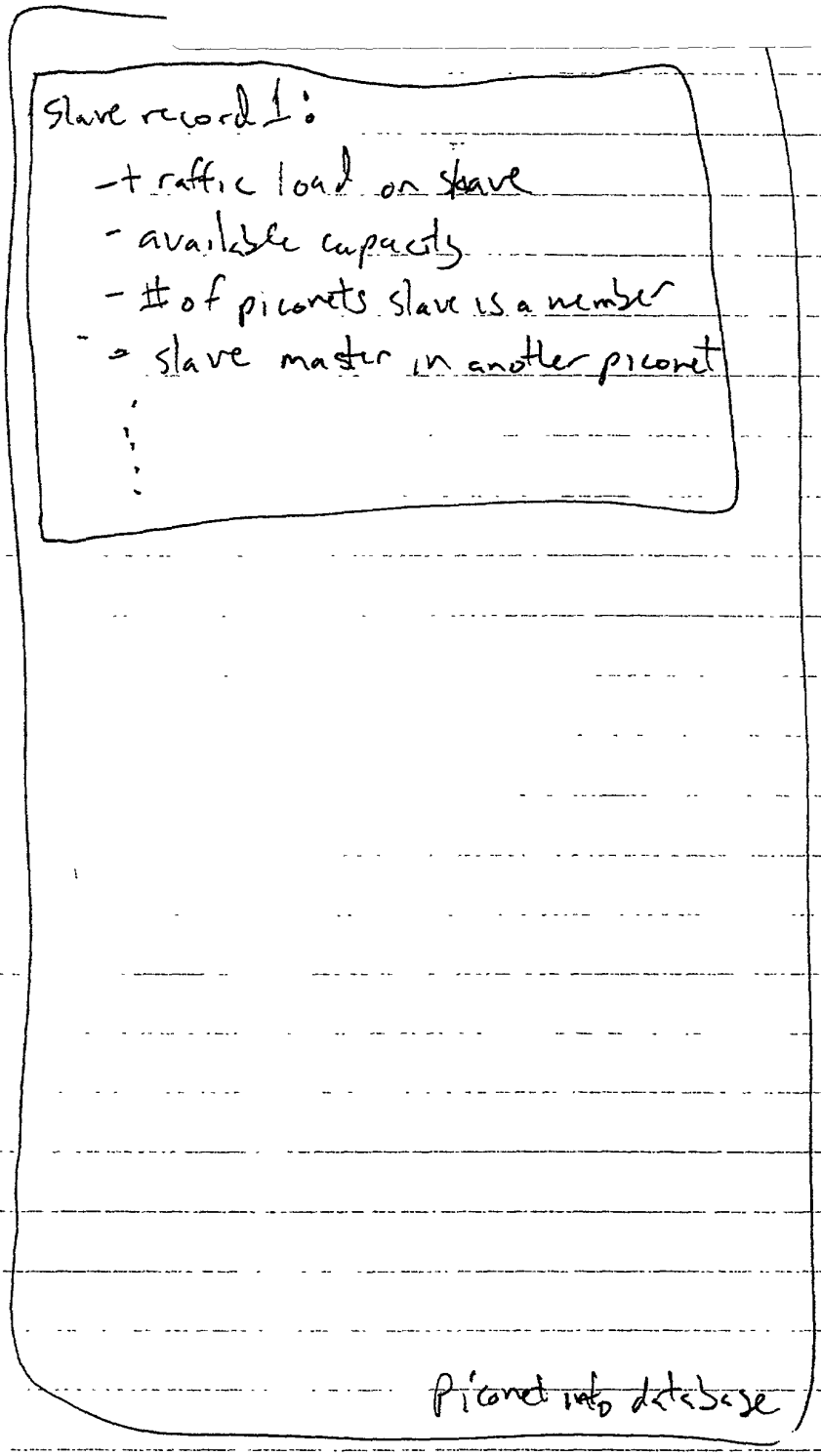


Fig 8

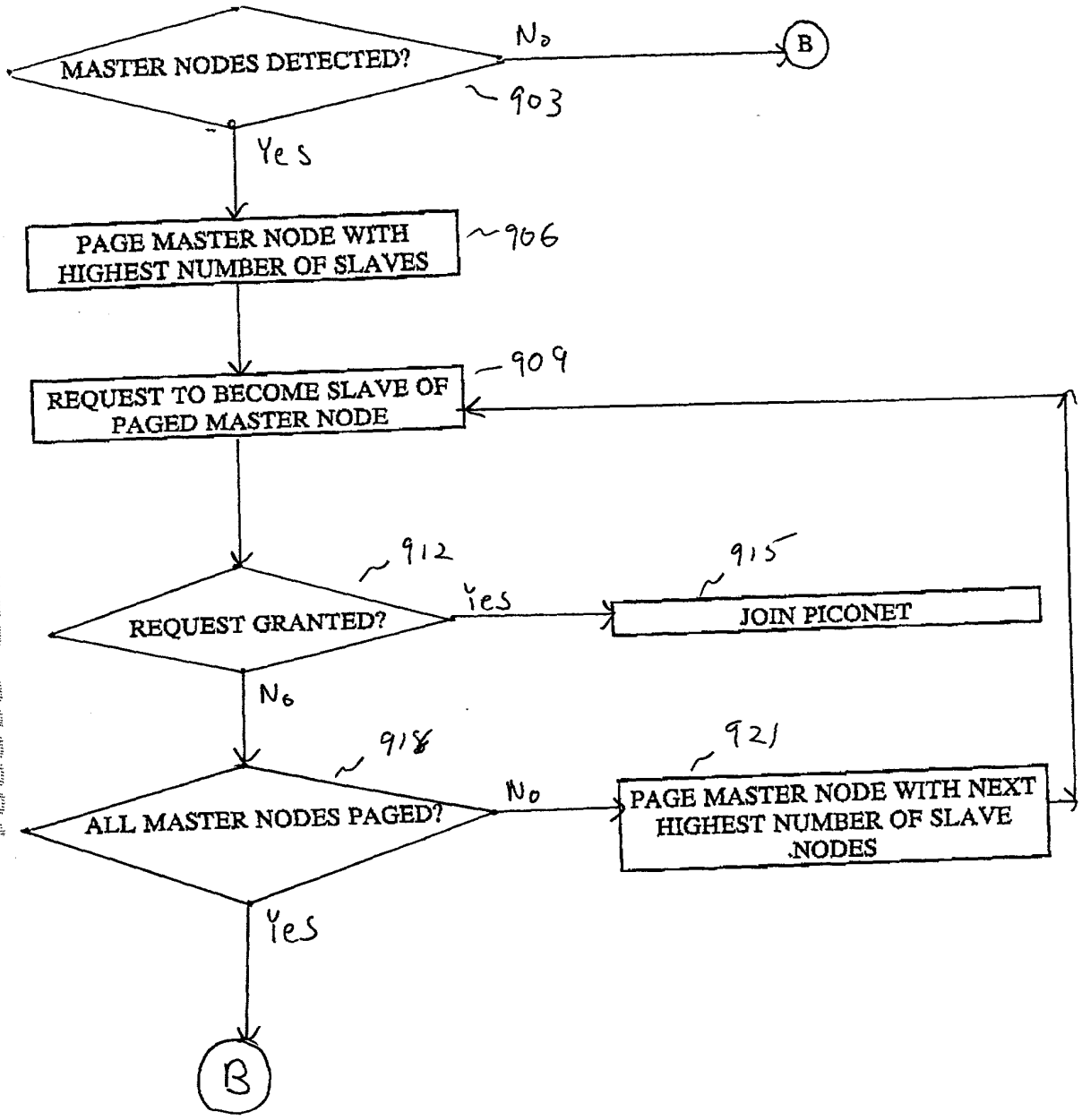

MASTER NODES DETECTED?
No
B
903
Yes
PAGE MASTER NODE WITH HIGHEST NUMBER OF SLAVES
906
REQUEST TO BECOME SLAVE OF PAGED MASTER NODE
909
912
REQUEST GRANTED?
Yes
915
JOIN PICONET
No
918
ALL MASTER NODES PAGED?
No
921
PAGE MASTER NODE WITH NEXT HIGHEST NUMBER OF SLAVE NODES
Yes
B

Fig 9A

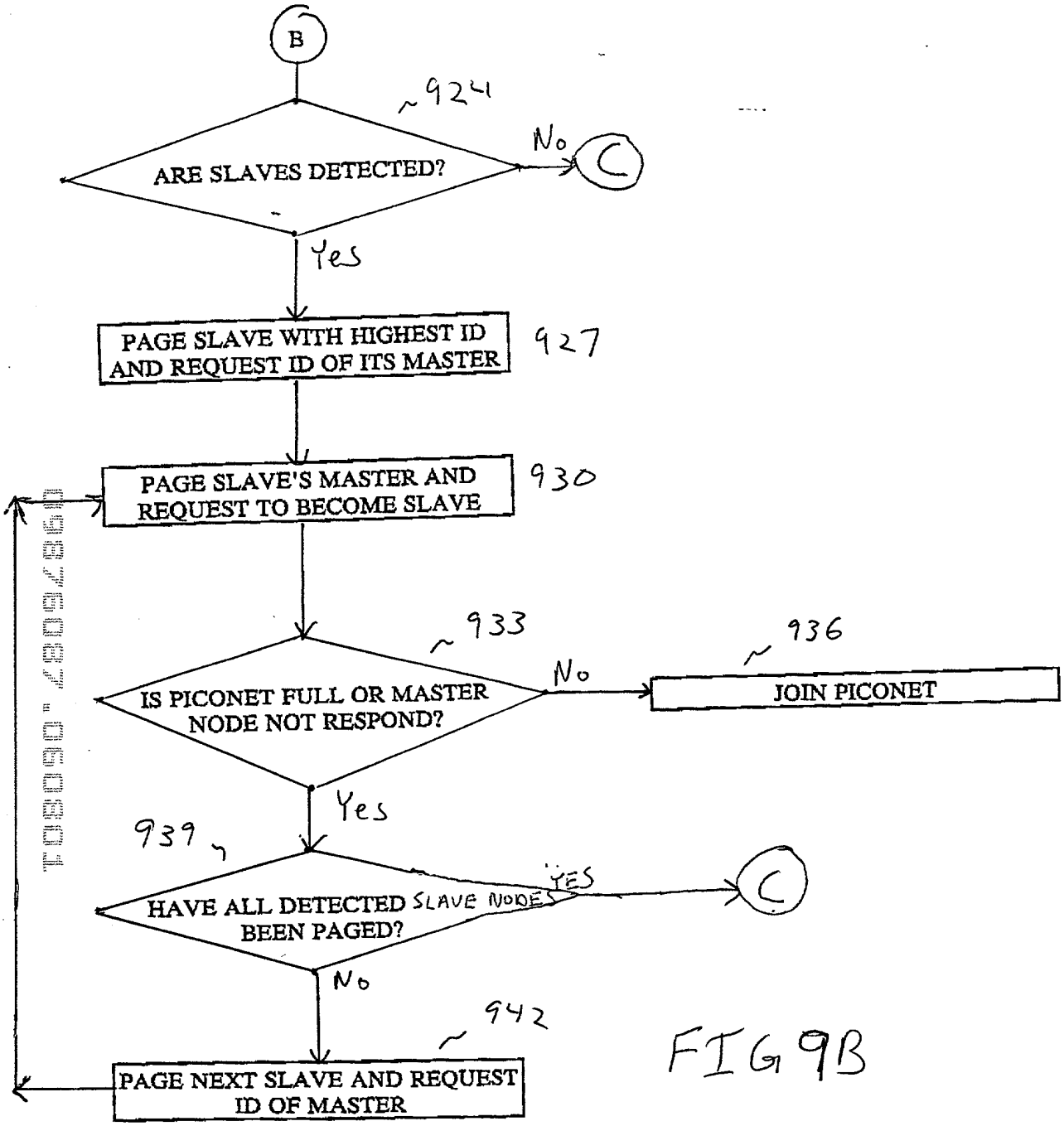

B
924
ARE SLAVES DETECTED?
No
C
Yes
PAGE SLAVE WITH HIGHEST ID AND REQUEST ID OF ITS MASTER
927
PAGE SLAVE'S MASTER AND REQUEST TO BECOME SLAVE
930
933
IS PICONET FULL OR MASTER NODE NOT RESPOND?
No
936
JOIN PICONET
Yes
939
HAVE ALL DETECTED SLAVE NODES BEEN PAGED?
YES
C
No
942
PAGE NEXT SLAVE AND REQUEST ID OF MASTER

FIG 9B

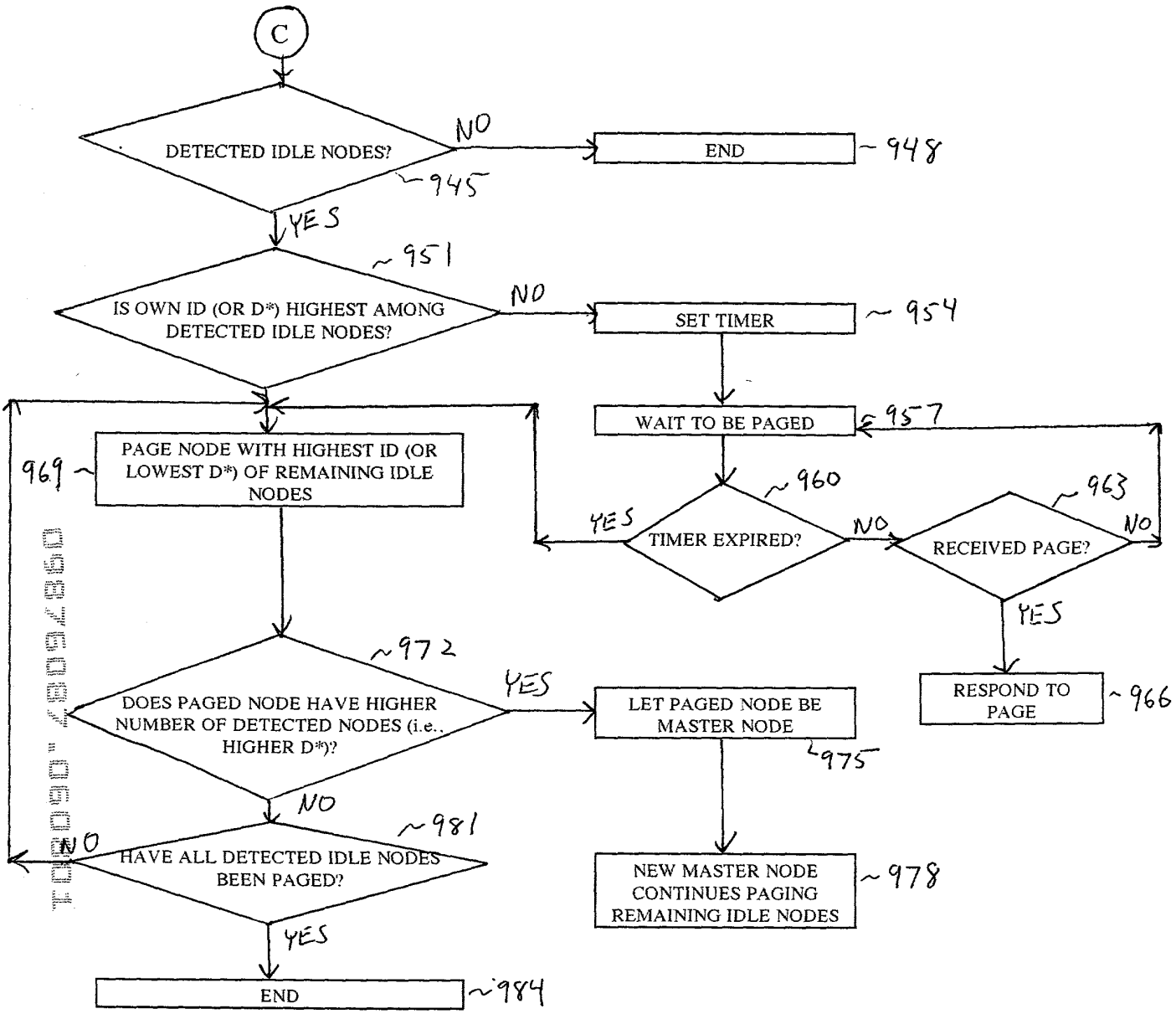

C
DETECTED IDLE NODES?
NO
END
948
945
YES
951
IS OWN ID (OR D*) HIGHEST AMONG DETECTED IDLE NODES?
NO
SET TIMER
954
WAIT TO BE PAGED
957
969
PAGE NODE WITH HIGHEST ID (OR LOWEST D*) OF REMAINING IDLE NODES
960
YES
TIMER EXPIRED?
NO
963
RECEIVED PAGE?
NO
YES
RESPOND TO PAGE
966
972
DOES PAGED NODE HAVE HIGHER NUMBER OF DETECTED NODES (i.e., HIGHER D*)?
YES
LET PAGED NODE BE MASTER NODE
975
NO
981
NO
HAVE ALL DETECTED IDLE NODES BEEN PAGED?
NEW MASTER NODE CONTINUES PAGING REMAINING IDLE NODES
978
YES
END
984

FIG 9C

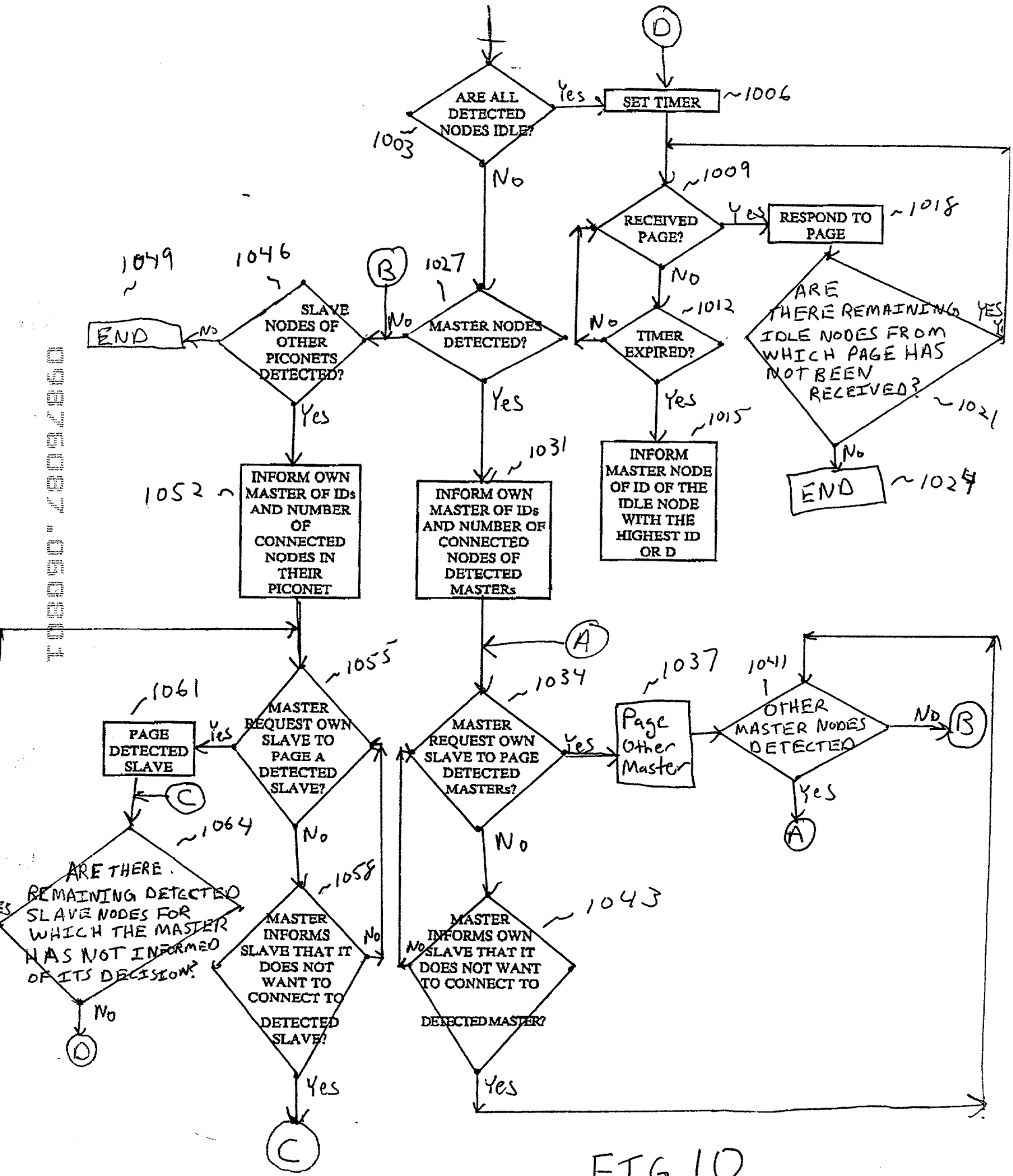

D
ARE ALL DETECTED NODES IDLE?
1003
Yes
SET TIMER
1006
No
1009
RECEIVED PAGE?
Yes
RESPOND TO PAGE
1018
No
1012
TIMER EXPIRED?
No
Yes
ARE THERE REMAINING IDLE NODES FROM WHICH PAGE HAS NOT BEEN RECEIVED?
YES
1021
No
END
1024
1015
INFORM MASTER NODE OF ID OF THE IDLE NODE WITH THE HIGHEST ID OR D
1049
END
No
1046
SLAVE NODES OF OTHER PICONETS DETECTED?
Yes
B
No
1027
MASTER NODES DETECTED?
Yes
1031
INFORM OWN MASTER OF IDs AND NUMBER OF CONNECTED NODES OF DETECTED MASTERs
1052
INFORM OWN MASTER OF IDs AND NUMBER OF CONNECTED NODES IN THEIR PICONET
A
1055
MASTER REQUEST OWN SLAVE TO PAGE A DETECTED SLAVE?
Yes
1061
PAGE DETECTED SLAVE
C
No
1064
ARE THERE REMAINING DETECTED SLAVE NODES FOR WHICH THE MASTER HAS NOT INFORMED OF ITS DECISION?
No
D
1058
MASTER INFORMS SLAVE THAT IT DOES NOT WANT TO CONNECT TO DETECTED SLAVE?
No
Yes
C
1034
MASTER REQUEST OWN SLAVE TO PAGE DETECTED MASTERs?
Yes
1037
Page Other Master
1041
OTHER MASTER NODES DETECTED
No
B
Yes
A
No
1043
MASTER INFORMS OWN SLAVE THAT IT DOES NOT WANT TO CONNECT TO DETECTED MASTER?
No
Yes

FIG 10

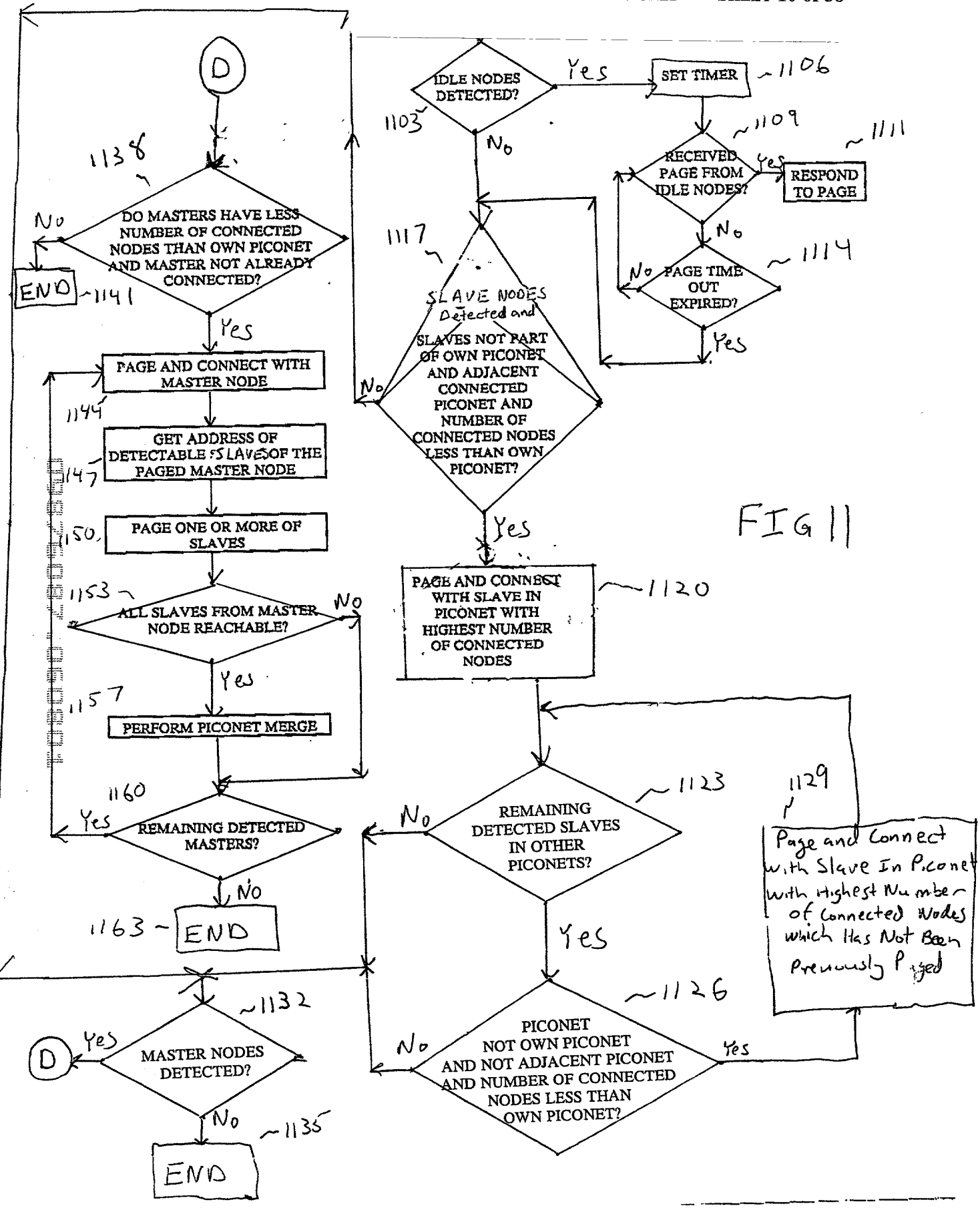

D
1138
DO MASTERS HAVE LESS NUMBER OF CONNECTED NODES THAN OWN PICONET AND MASTER NOT ALREADY CONNECTED?
No
END
1141
Yes
PAGE AND CONNECT WITH MASTER NODE
1144
GET ADDRESS OF DETECTABLE SLAVES OF THE PAGED MASTER NODE
1147
PAGE ONE OR MORE OF SLAVES
1150
1153
ALL SLAVES FROM MASTER NODE REACHABLE?
No
Yes
1157
PERFORM PICONET MERGE
1160
REMAINING DETECTED MASTERS?
Yes
No
1163
END
1132
MASTER NODES DETECTED?
Yes
D
No
1135
END
IDLE NODES DETECTED?
Yes
SET TIMER
1106
1103
No
1109
RECEIVED PAGE FROM IDLE NODES?
Yes
1111
RESPOND TO PAGE
No
1114
PAGE TIME OUT EXPIRED?
No
Yes
1117
SLAVE NODES Detected and SLAVES NOT PART OF OWN PICONET AND ADJACENT CONNECTED PICONET AND NUMBER OF CONNECTED NODES LESS THAN OWN PICONET?
No
Yes
PAGE AND CONNECT WITH SLAVE IN PICONET WITH HIGHEST NUMBER OF CONNECTED NODES
1120
1123
REMAINING DETECTED SLAVES IN OTHER PICONETS?
No
Yes
1126
PICONET NOT OWN PICONET AND NOT ADJACENT PICONET AND NUMBER OF CONNECTED NODES LESS THAN OWN PICONET?
No
Yes
1129
Page and Connect with Slave In Piconet with Highest Number of Connected Nodes which Has Not Been Previously Paged

FIG 11

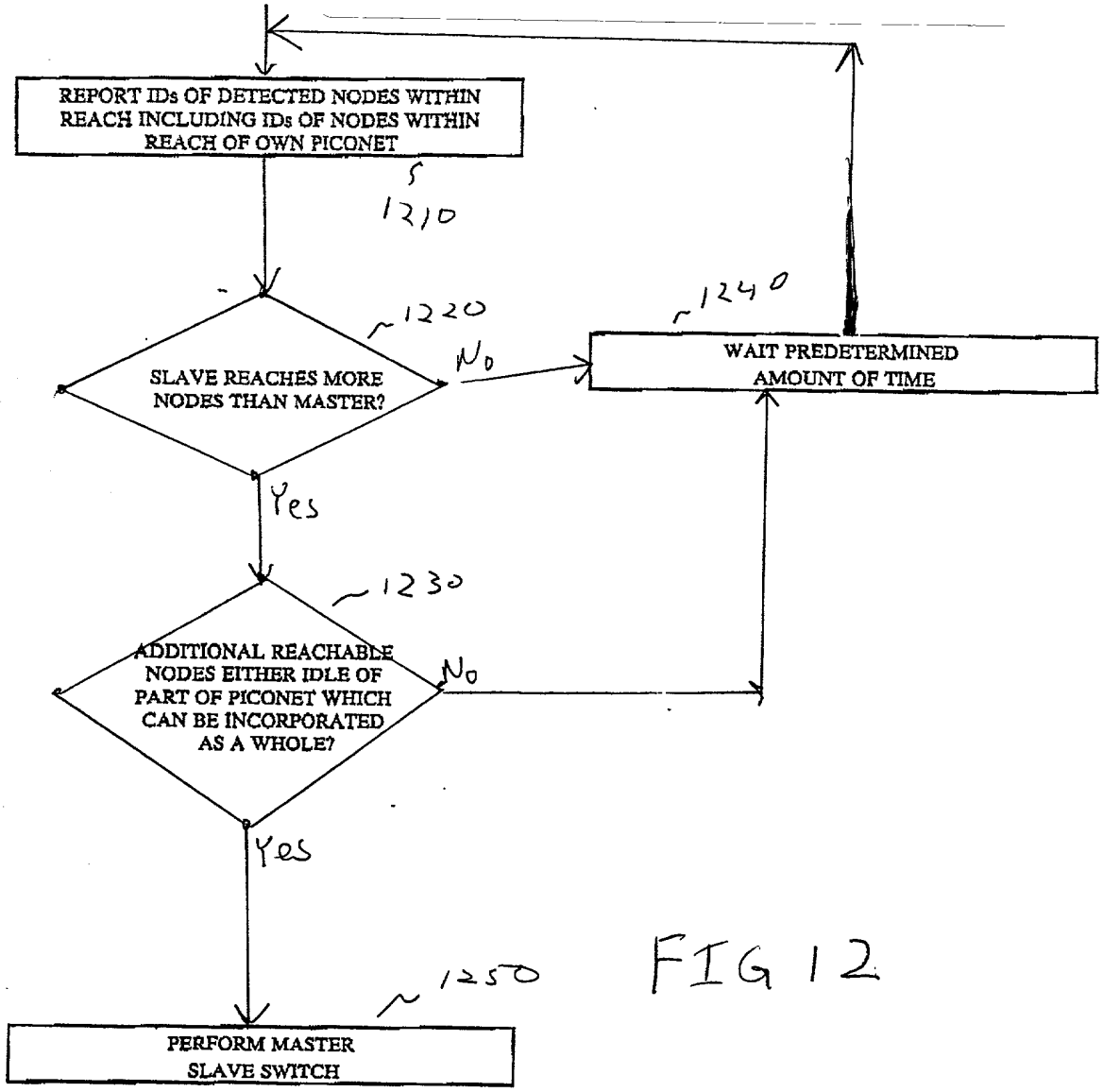

REPORT IDs OF DETECTED NODES WITHIN REACH INCLUDING IDs OF NODES WITHIN REACH OF OWN PICONET
1210
SLAVE REACHES MORE NODES THAN MASTER?
1220
No
WAIT PREDETERMINED AMOUNT OF TIME
1240
Yes
ADDITIONAL REACHABLE NODES EITHER IDLE OF PART OF PICONET WHICH CAN BE INCORPORATED AS A WHOLE?
1230
No
Yes
PERFORM MASTER SLAVE SWITCH
1250

FIG 12

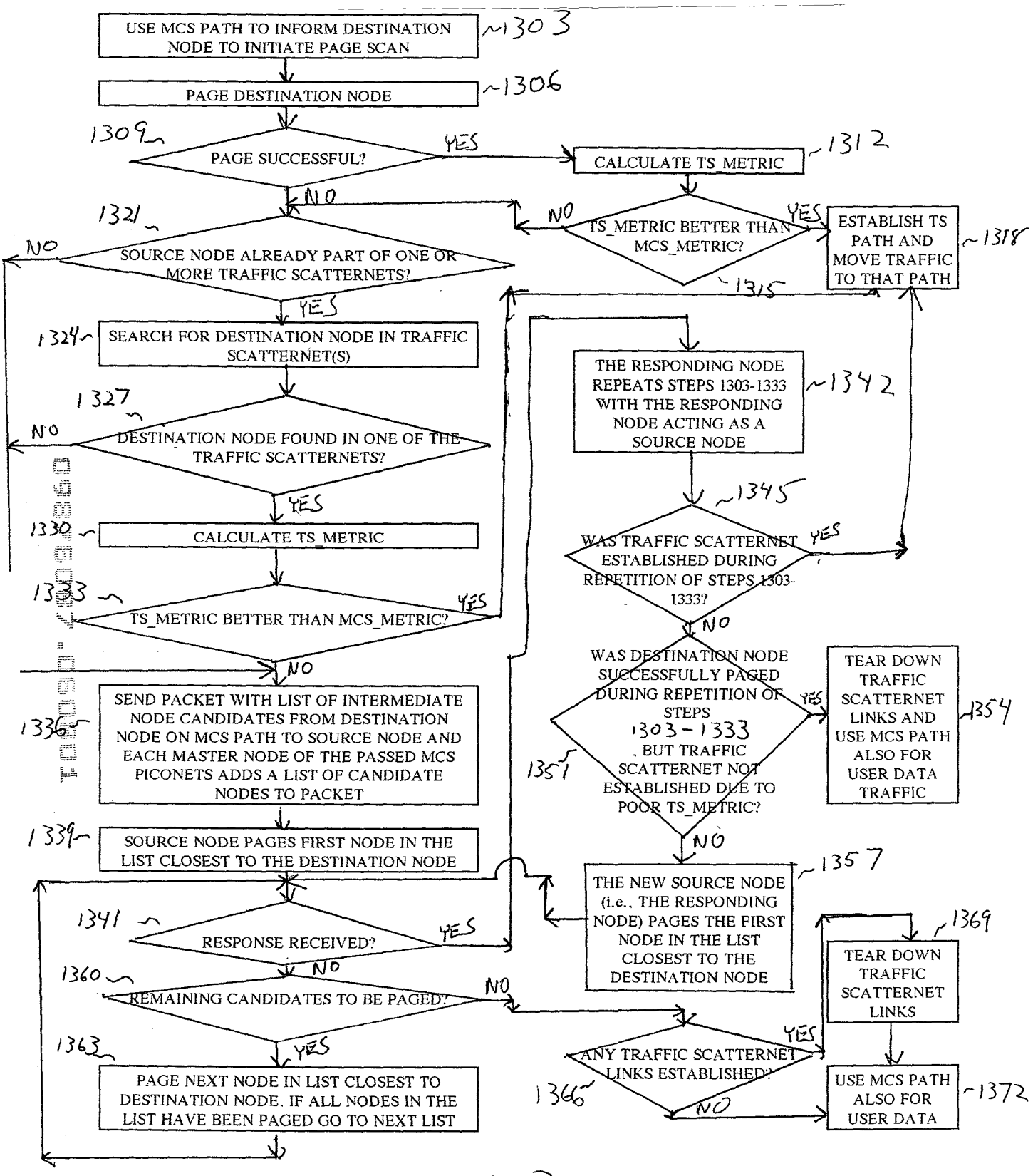

USE MCS PATH TO INFORM DESTINATION NODE TO INITIATE PAGE SCAN
1303
PAGE DESTINATION NODE
1306
1309
PAGE SUCCESSFUL?
YES
NO
CALCULATE TS_METRIC
1312
1321
SOURCE NODE ALREADY PART OF ONE OR MORE TRAFFIC SCATTERNETS?
NO
YES
TS_METRIC BETTER THAN MCS_METRIC?
NO
YES
ESTABLISH TS PATH AND MOVE TRAFFIC TO THAT PATH
1318
1315
1324
SEARCH FOR DESTINATION NODE IN TRAFFIC SCATTERNET(S)
1327
DESTINATION NODE FOUND IN ONE OF THE TRAFFIC SCATTERNETS?
NO
YES
1330
CALCULATE TS_METRIC
1333
TS_METRIC BETTER THAN MCS_METRIC?
YES
NO
1336
SEND PACKET WITH LIST OF INTERMEDIATE NODE CANDIDATES FROM DESTINATION NODE ON MCS PATH TO SOURCE NODE AND EACH MASTER NODE OF THE PASSED MCS PICONETS ADDS A LIST OF CANDIDATE NODES TO PACKET
1339
SOURCE NODE PAGES FIRST NODE IN THE LIST CLOSEST TO THE DESTINATION NODE
1341
RESPONSE RECEIVED?
YES
NO
1360
REMAINING CANDIDATES TO BE PAGED?
NO
YES
1363
PAGE NEXT NODE IN LIST CLOSEST TO DESTINATION NODE. IF ALL NODES IN THE LIST HAVE BEEN PAGED GO TO NEXT LIST
THE RESPONDING NODE REPEATS STEPS 1303-1333 WITH THE RESPONDING NODE ACTING AS A SOURCE NODE
1342
1345
WAS TRAFFIC SCATTERNET ESTABLISHED DURING REPETITION OF STEPS 1303-1333?
YES
NO
WAS DESTINATION NODE SUCCESSFULLY PAGED DURING REPETITION OF STEPS 1303-1333, BUT TRAFFIC SCATTERNET NOT ESTABLISHED DUE TO POOR TS_METRIC?
1351
YES
TEAR DOWN TRAFFIC SCATTERNET LINKS AND USE MCS PATH ALSO FOR USER DATA TRAFFIC
1354
NO
THE NEW SOURCE NODE (i.e., THE RESPONDING NODE) PAGES THE FIRST NODE IN THE LIST CLOSEST TO THE DESTINATION NODE
1357
1369
TEAR DOWN TRAFFIC SCATTERNET LINKS
ANY TRAFFIC SCATTERNET LINKS ESTABLISHED?
1366
YES
NO
USE MCS PATH ALSO FOR USER DATA
1372

FIG 13

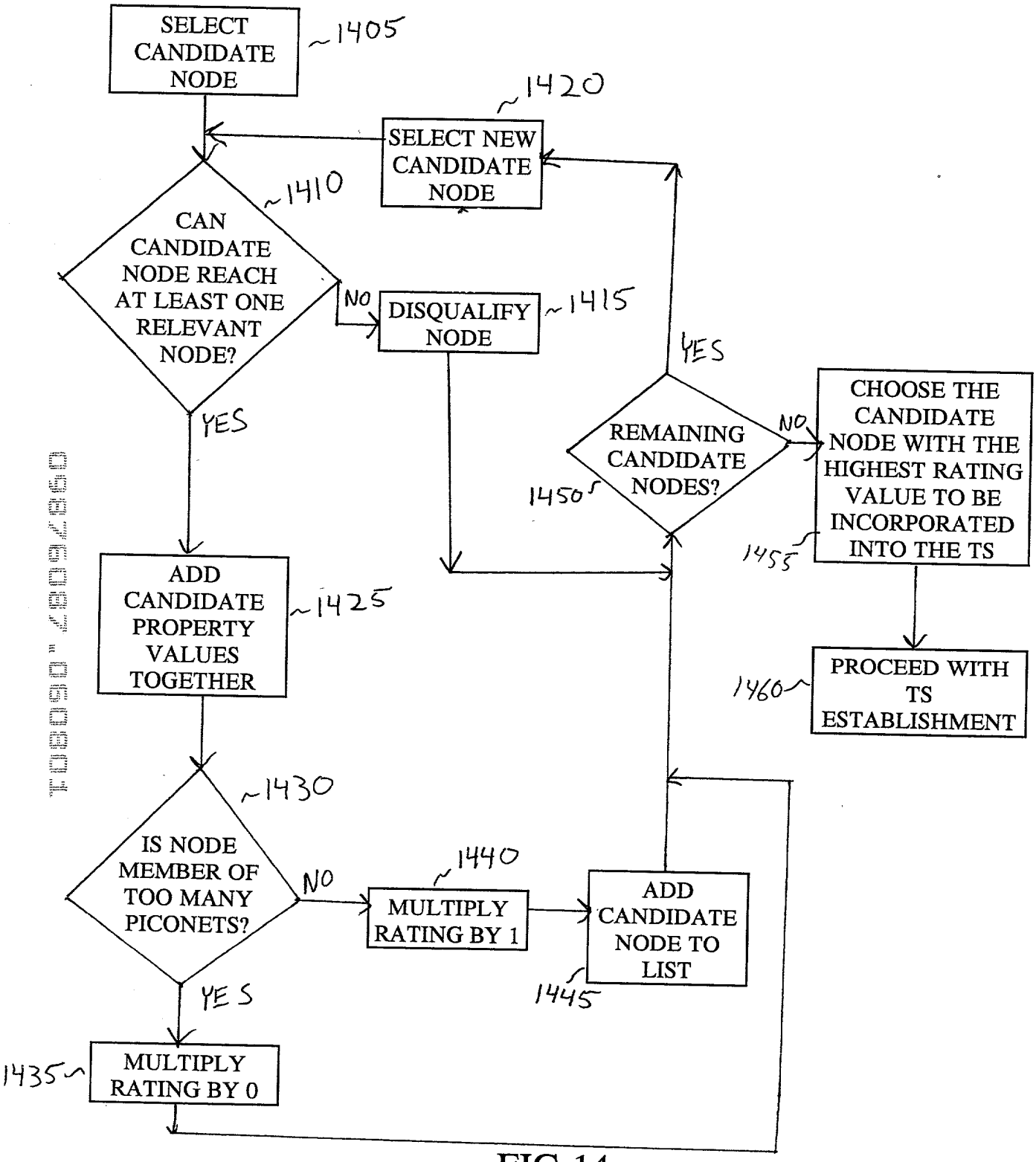

SELECT CANDIDATE NODE
1405
SELECT NEW CANDIDATE NODE
1420
CAN CANDIDATE NODE REACH AT LEAST ONE RELEVANT NODE?
1410
NO
DISQUALIFY NODE
1415
YES
REMAINING CANDIDATE NODES?
1450
NO
CHOOSE THE CANDIDATE NODE WITH THE HIGHEST RATING VALUE TO BE INCORPORATED INTO THE TS
1455
YES
ADD CANDIDATE PROPERTY VALUES TOGETHER
1425
PROCEED WITH TS ESTABLISHMENT
1460
IS NODE MEMBER OF TOO MANY PICONETS?
1430
NO
MULTIPLY RATING BY 1
1440
ADD CANDIDATE NODE TO LIST
1445
YES
MULTIPLY RATING BY 0
1435

FIG 14

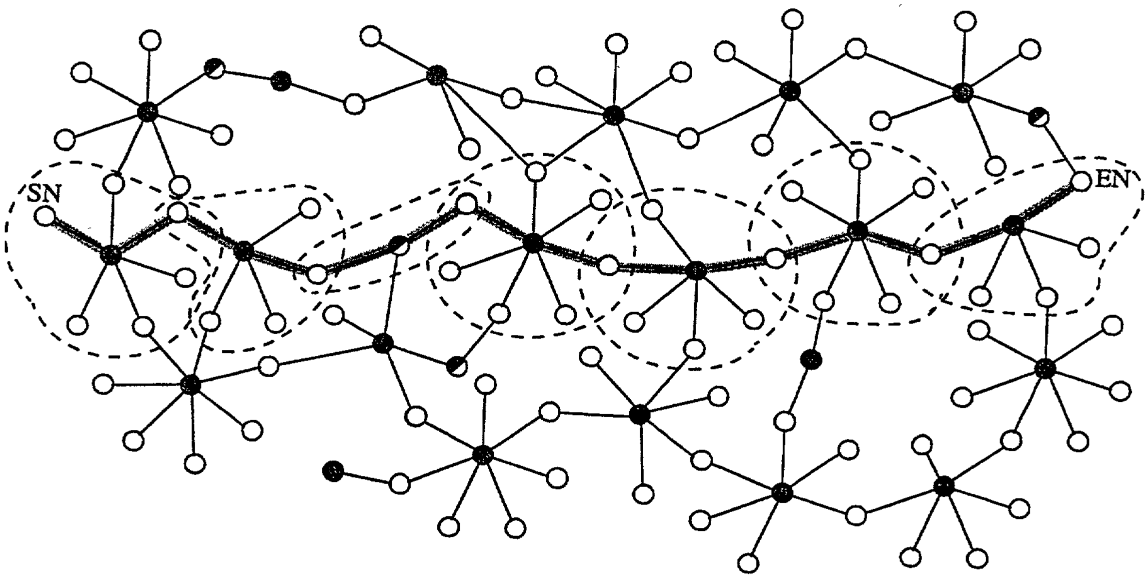


Fig 15

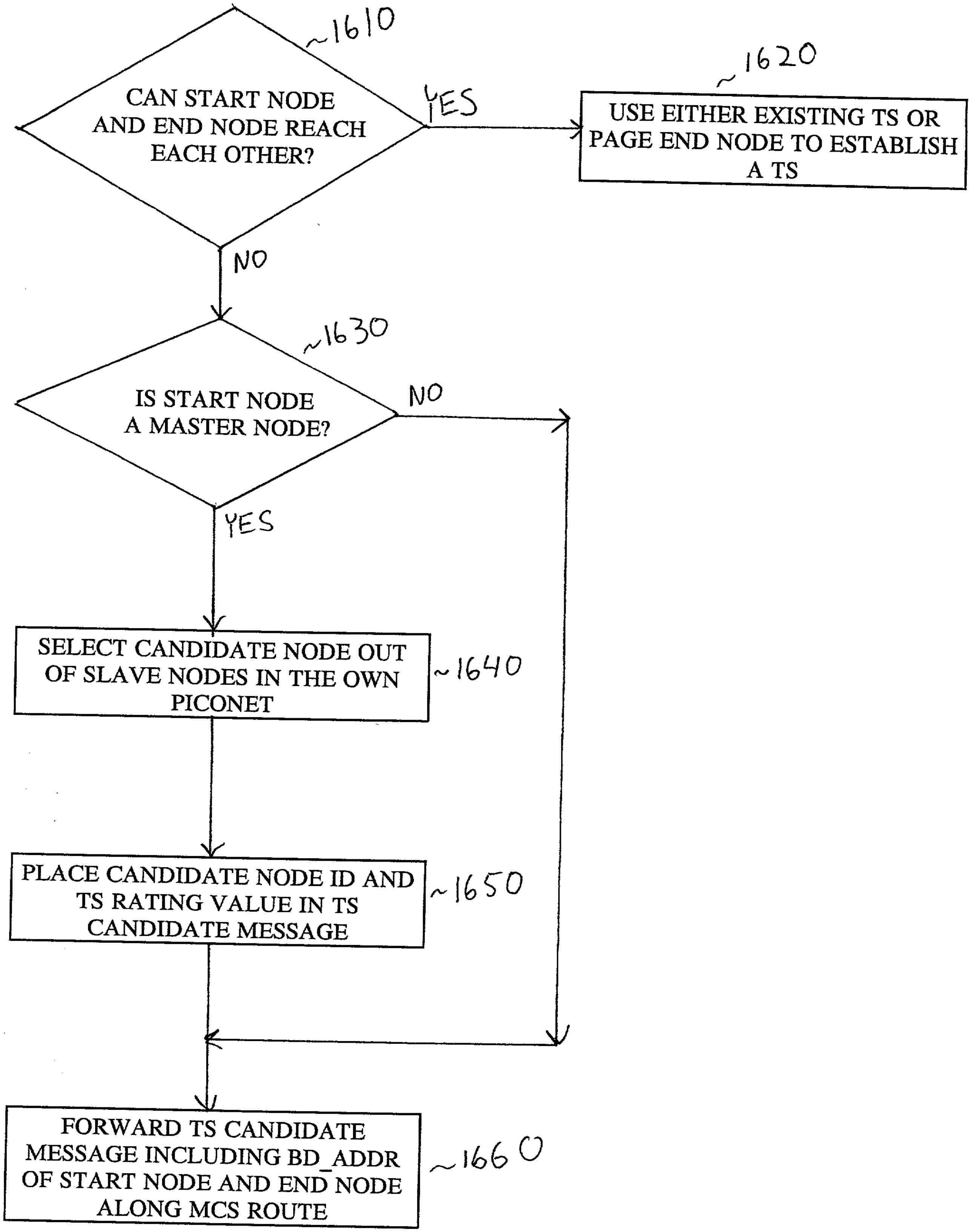


FIG 16

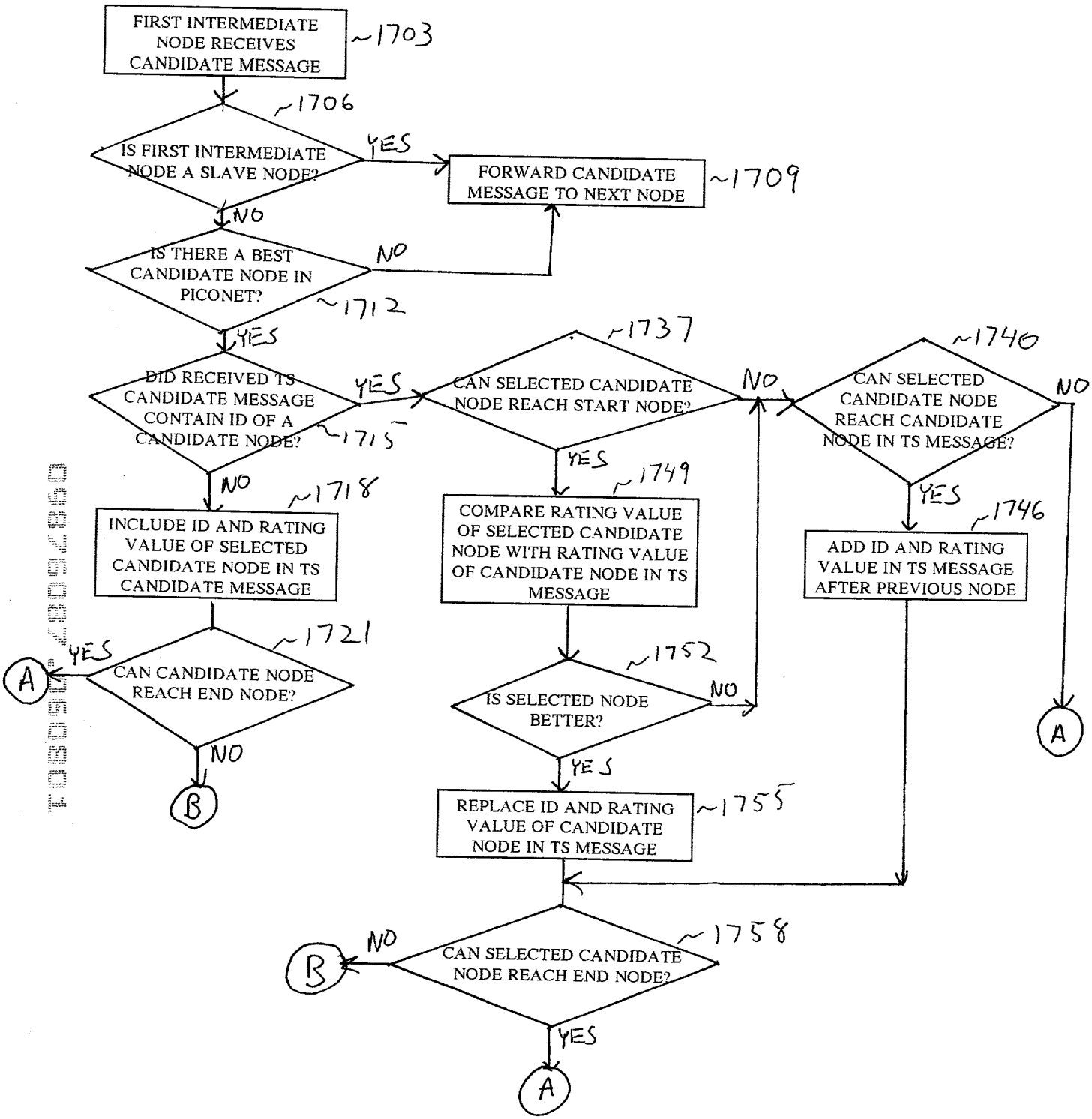

FIRST INTERMEDIATE NODE RECEIVES CANDIDATE MESSAGE
1703
1706
IS FIRST INTERMEDIATE NODE A SLAVE NODE?
YES
FORWARD CANDIDATE MESSAGE TO NEXT NODE
1709
NO
IS THERE A BEST CANDIDATE NODE IN PICONET?
NO
1712
YES
DID RECEIVED TS CANDIDATE MESSAGE CONTAIN ID OF A CANDIDATE NODE?
YES
1715
NO
1718
INCLUDE ID AND RATING VALUE OF SELECTED CANDIDATE NODE IN TS CANDIDATE MESSAGE
1721
CAN CANDIDATE NODE REACH END NODE?
YES
A
NO
B
1737
CAN SELECTED CANDIDATE NODE REACH START NODE?
NO
YES
1749
COMPARE RATING VALUE OF SELECTED CANDIDATE NODE WITH RATING VALUE OF CANDIDATE NODE IN TS MESSAGE
1752
IS SELECTED NODE BETTER?
NO
YES
1755
REPLACE ID AND RATING VALUE OF CANDIDATE NODE IN TS MESSAGE
1740
CAN SELECTED CANDIDATE NODE REACH CANDIDATE NODE IN TS MESSAGE?
NO
A
YES
1746
ADD ID AND RATING VALUE IN TS MESSAGE AFTER PREVIOUS NODE
1758
CAN SELECTED CANDIDATE NODE REACH END NODE?
NO
B
YES
A

FIG 17A

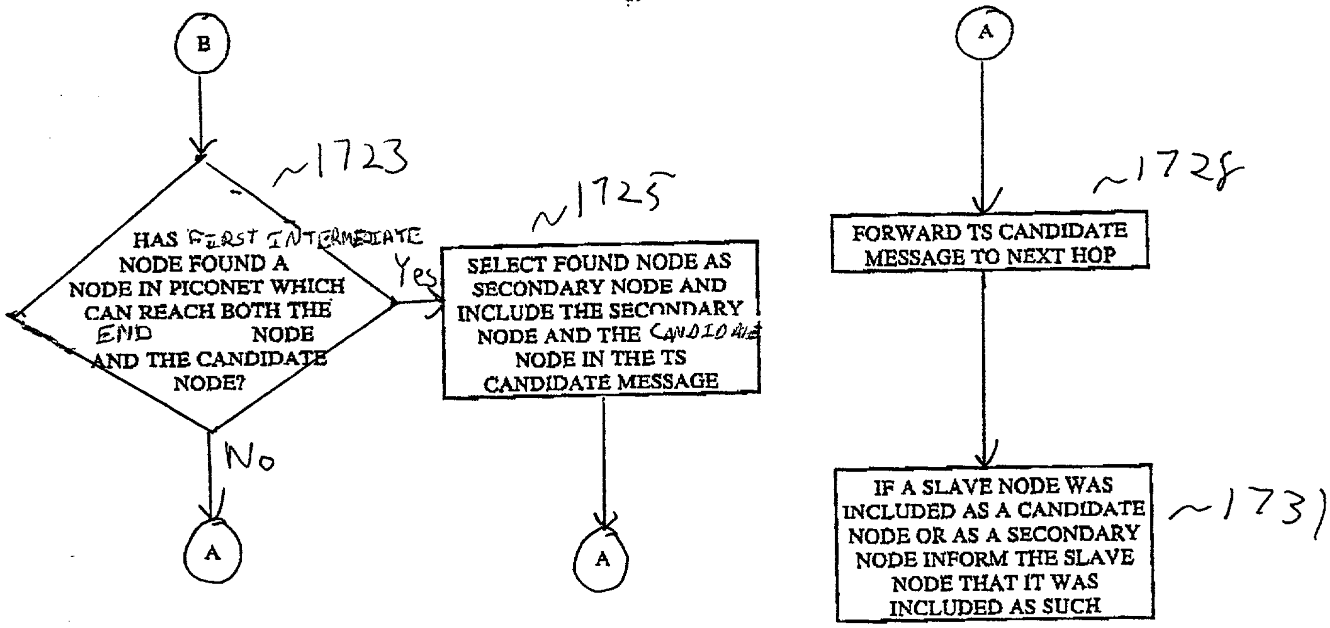

B
1723
HAS FIRST INTERMEDIATE NODE FOUND A NODE IN PICONET WHICH CAN REACH BOTH THE END NODE AND THE CANDIDATE NODE?
Yes
No
A
1725
SELECT FOUND NODE AS SECONDARY NODE AND INCLUDE THE SECONDARY NODE AND THE CANDIDATE NODE IN THE TS CANDIDATE MESSAGE
A
A
1728
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP
1731
IF A SLAVE NODE WAS INCLUDED AS A CANDIDATE NODE OR AS A SECONDARY NODE INFORM THE SLAVE NODE THAT IT WAS INCLUDED AS SUCH

FIG 17B

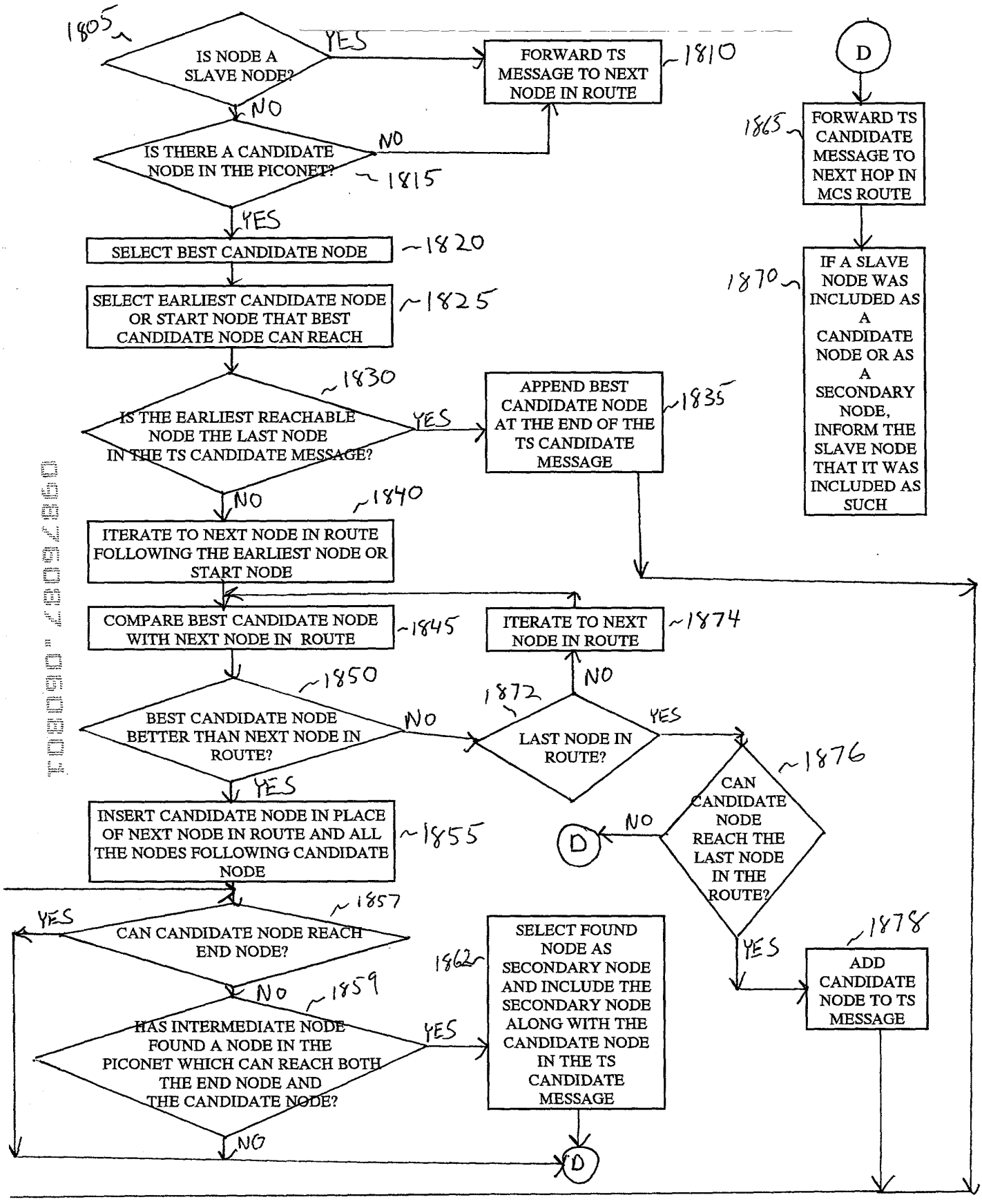

1805
IS NODE A SLAVE NODE?
YES
FORWARD TS MESSAGE TO NEXT NODE IN ROUTE
1810
NO
IS THERE A CANDIDATE NODE IN THE PICONET?
NO
1815
YES
SELECT BEST CANDIDATE NODE
1820
SELECT EARLIEST CANDIDATE NODE OR START NODE THAT BEST CANDIDATE NODE CAN REACH
1825
1830
IS THE EARLIEST REACHABLE NODE THE LAST NODE IN THE TS CANDIDATE MESSAGE?
YES
APPEND BEST CANDIDATE NODE AT THE END OF THE TS CANDIDATE MESSAGE
1835
NO
1840
ITERATE TO NEXT NODE IN ROUTE FOLLOWING THE EARLIEST NODE OR START NODE
COMPARE BEST CANDIDATE NODE WITH NEXT NODE IN ROUTE
1845
1850
BEST CANDIDATE NODE BETTER THAN NEXT NODE IN ROUTE?
NO
YES
INSERT CANDIDATE NODE IN PLACE OF NEXT NODE IN ROUTE AND ALL THE NODES FOLLOWING CANDIDATE NODE
1855
1857
CAN CANDIDATE NODE REACH END NODE?
YES
NO
1859
HAS INTERMEDIATE NODE FOUND A NODE IN THE PICONET WHICH CAN REACH BOTH THE END NODE AND THE CANDIDATE NODE?
YES
NO
1862
SELECT FOUND NODE AS SECONDARY NODE AND INCLUDE THE SECONDARY NODE ALONG WITH THE CANDIDATE NODE IN THE TS CANDIDATE MESSAGE
D
ITERATE TO NEXT NODE IN ROUTE
1874
NO
1872
LAST NODE IN ROUTE?
YES
1876
CAN CANDIDATE NODE REACH THE LAST NODE IN THE ROUTE?
NO
D
YES
1878
ADD CANDIDATE NODE TO TS MESSAGE
D
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP IN MCS ROUTE
1865
IF A SLAVE NODE WAS INCLUDED AS A CANDIDATE NODE OR AS A SECONDARY NODE, INFORM THE SLAVE NODE THAT IT WAS INCLUDED AS SUCH
1870

FIG 18A

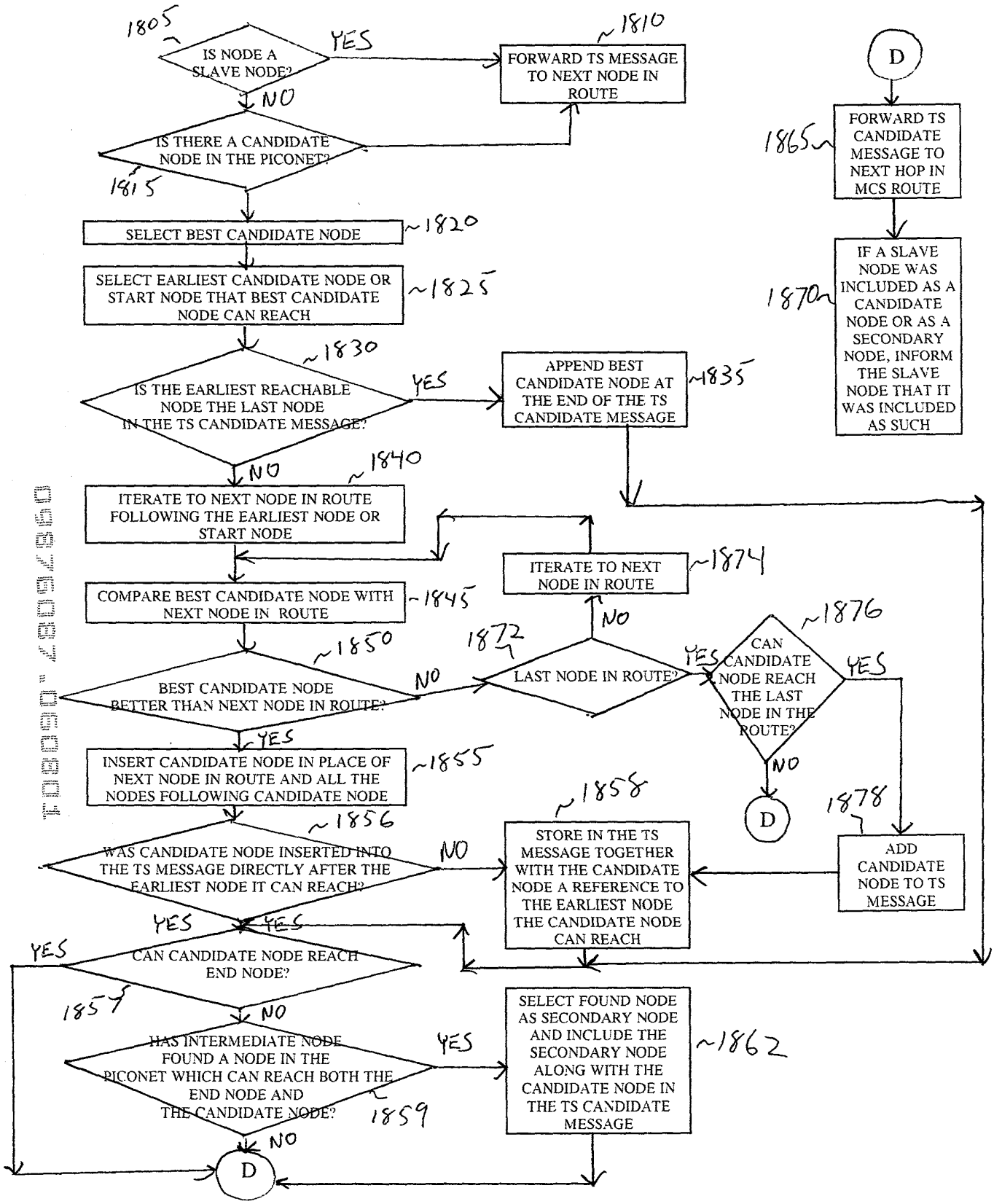

1805
IS NODE A SLAVE NODE?
YES
1810
FORWARD TS MESSAGE TO NEXT NODE IN ROUTE
NO
IS THERE A CANDIDATE NODE IN THE PICONET?
1815
SELECT BEST CANDIDATE NODE
1820
SELECT EARLIEST CANDIDATE NODE OR START NODE THAT BEST CANDIDATE NODE CAN REACH
1825
1830
IS THE EARLIEST REACHABLE NODE THE LAST NODE IN THE TS CANDIDATE MESSAGE?
YES
APPEND BEST CANDIDATE NODE AT THE END OF THE TS CANDIDATE MESSAGE
1835
NO
1840
ITERATE TO NEXT NODE IN ROUTE FOLLOWING THE EARLIEST NODE OR START NODE
COMPARE BEST CANDIDATE NODE WITH NEXT NODE IN ROUTE
1845
1850
BEST CANDIDATE NODE BETTER THAN NEXT NODE IN ROUTE?
NO
1872
LAST NODE IN ROUTE?
NO
ITERATE TO NEXT NODE IN ROUTE
1874
YES
1876
CAN CANDIDATE NODE REACH THE LAST NODE IN THE ROUTE?
YES
NO
YES
INSERT CANDIDATE NODE IN PLACE OF NEXT NODE IN ROUTE AND ALL THE NODES FOLLOWING CANDIDATE NODE
1855
1856
WAS CANDIDATE NODE INSERTED INTO THE TS MESSAGE DIRECTLY AFTER THE EARLIEST NODE IT CAN REACH?
NO
1858
STORE IN THE TS MESSAGE TOGETHER WITH THE CANDIDATE NODE A REFERENCE TO THE EARLIEST NODE THE CANDIDATE NODE CAN REACH
D
1878
ADD CANDIDATE NODE TO TS MESSAGE
YES
YES
YES
CAN CANDIDATE NODE REACH END NODE?
1857
NO
HAS INTERMEDIATE NODE FOUND A NODE IN THE PICONET WHICH CAN REACH BOTH THE END NODE AND THE CANDIDATE NODE?
YES
1859
SELECT FOUND NODE AS SECONDARY NODE AND INCLUDE THE SECONDARY NODE ALONG WITH THE CANDIDATE NODE IN THE TS CANDIDATE MESSAGE
1862
NO
D
D
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP IN MCS ROUTE
1865
IF A SLAVE NODE WAS INCLUDED AS A CANDIDATE NODE OR AS A SECONDARY NODE, INFORM THE SLAVE NODE THAT IT WAS INCLUDED AS SUCH
1870

FIG 18B

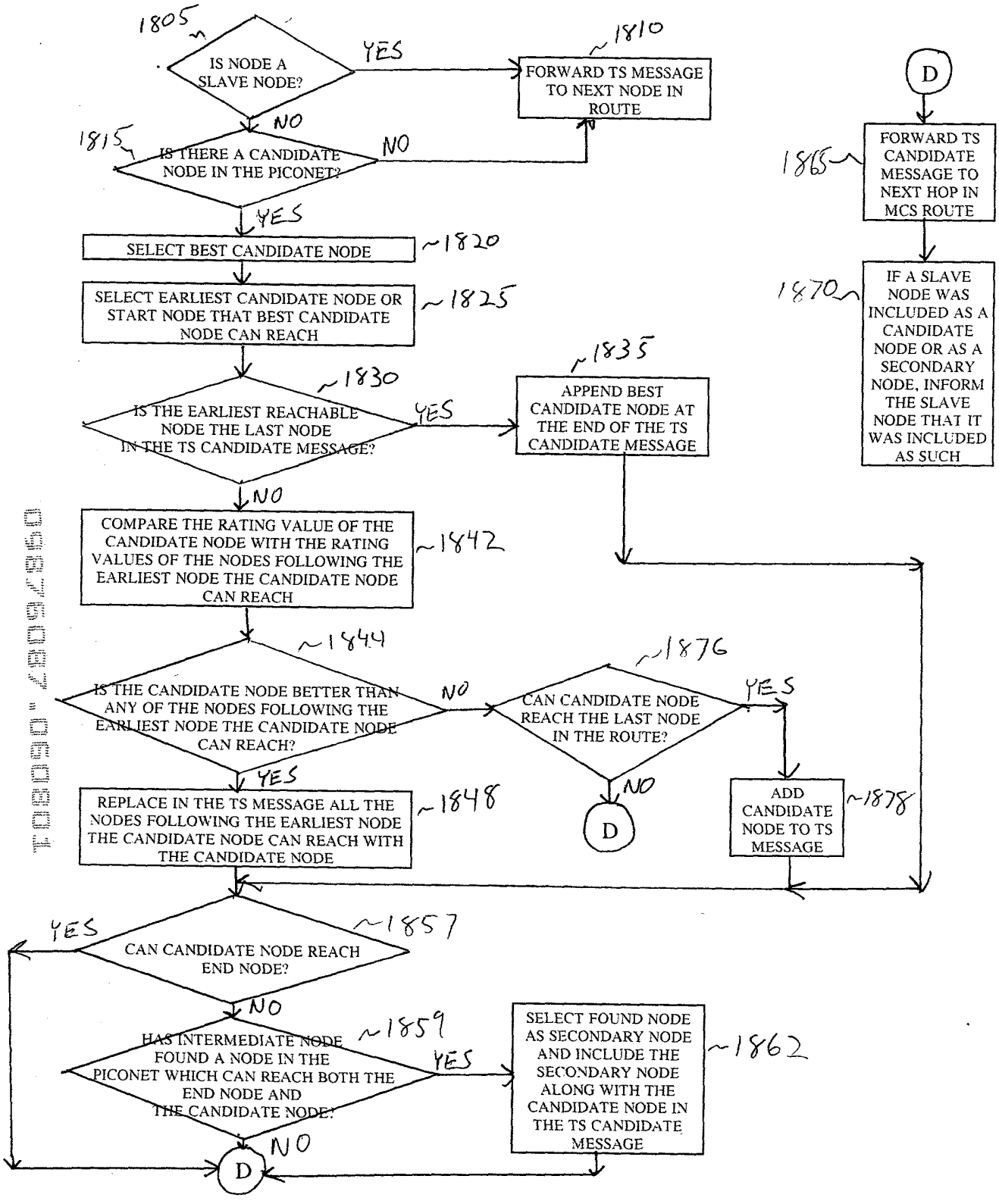

1805
IS NODE A SLAVE NODE?
YES
1810
FORWARD TS MESSAGE TO NEXT NODE IN ROUTE
NO
1815
IS THERE A CANDIDATE NODE IN THE PICONET?
NO
YES
SELECT BEST CANDIDATE NODE
1820
SELECT EARLIEST CANDIDATE NODE OR START NODE THAT BEST CANDIDATE NODE CAN REACH
1825
1830
IS THE EARLIEST REACHABLE NODE THE LAST NODE IN THE TS CANDIDATE MESSAGE?
YES
1835
APPEND BEST CANDIDATE NODE AT THE END OF THE TS CANDIDATE MESSAGE
NO
COMPARE THE RATING VALUE OF THE CANDIDATE NODE WITH THE RATING VALUES OF THE NODES FOLLOWING THE EARLIEST NODE THE CANDIDATE NODE CAN REACH
1842
1844
IS THE CANDIDATE NODE BETTER THAN ANY OF THE NODES FOLLOWING THE EARLIEST NODE THE CANDIDATE NODE CAN REACH?
NO
1876
CAN CANDIDATE NODE REACH THE LAST NODE IN THE ROUTE?
YES
YES
REPLACE IN THE TS MESSAGE ALL THE NODES FOLLOWING THE EARLIEST NODE THE CANDIDATE NODE CAN REACH WITH THE CANDIDATE NODE
1848
NO
D
ADD CANDIDATE NODE TO TS MESSAGE
1878
YES
1857
CAN CANDIDATE NODE REACH END NODE?
NO
1859
HAS INTERMEDIATE NODE FOUND A NODE IN THE PICONET WHICH CAN REACH BOTH THE END NODE AND THE CANDIDATE NODE?
YES
SELECT FOUND NODE AS SECONDARY NODE AND INCLUDE THE SECONDARY NODE ALONG WITH THE CANDIDATE NODE IN THE TS CANDIDATE MESSAGE
1862
NO
D
D
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP IN MCS ROUTE
1865
IF A SLAVE NODE WAS INCLUDED AS A CANDIDATE NODE OR AS A SECONDARY NODE, INFORM THE SLAVE NODE THAT IT WAS INCLUDED AS SUCH
1870

FIG 18C

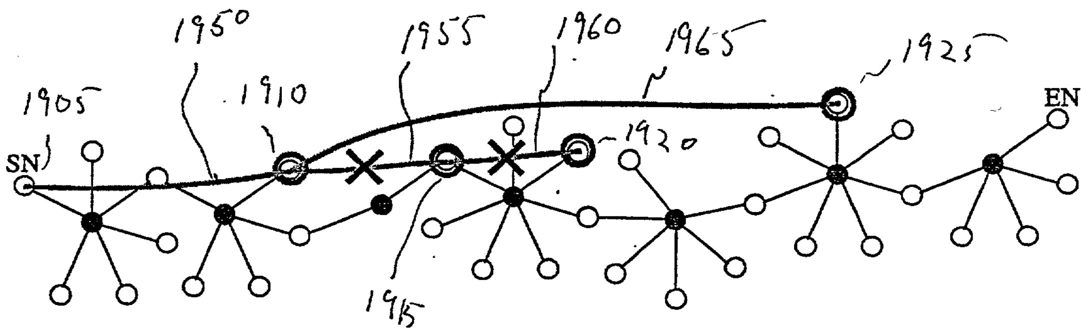


Fig 19

APPLN. FILING DATE: JUNE 8, 2001
TITLE: EFFICIENT SCATTERNET FORMING
INVENTOR(S): PER JOHANSSON ET AL.
APPLICATION SERIAL NO: UNASSIGNED
SHEET 22 of 38

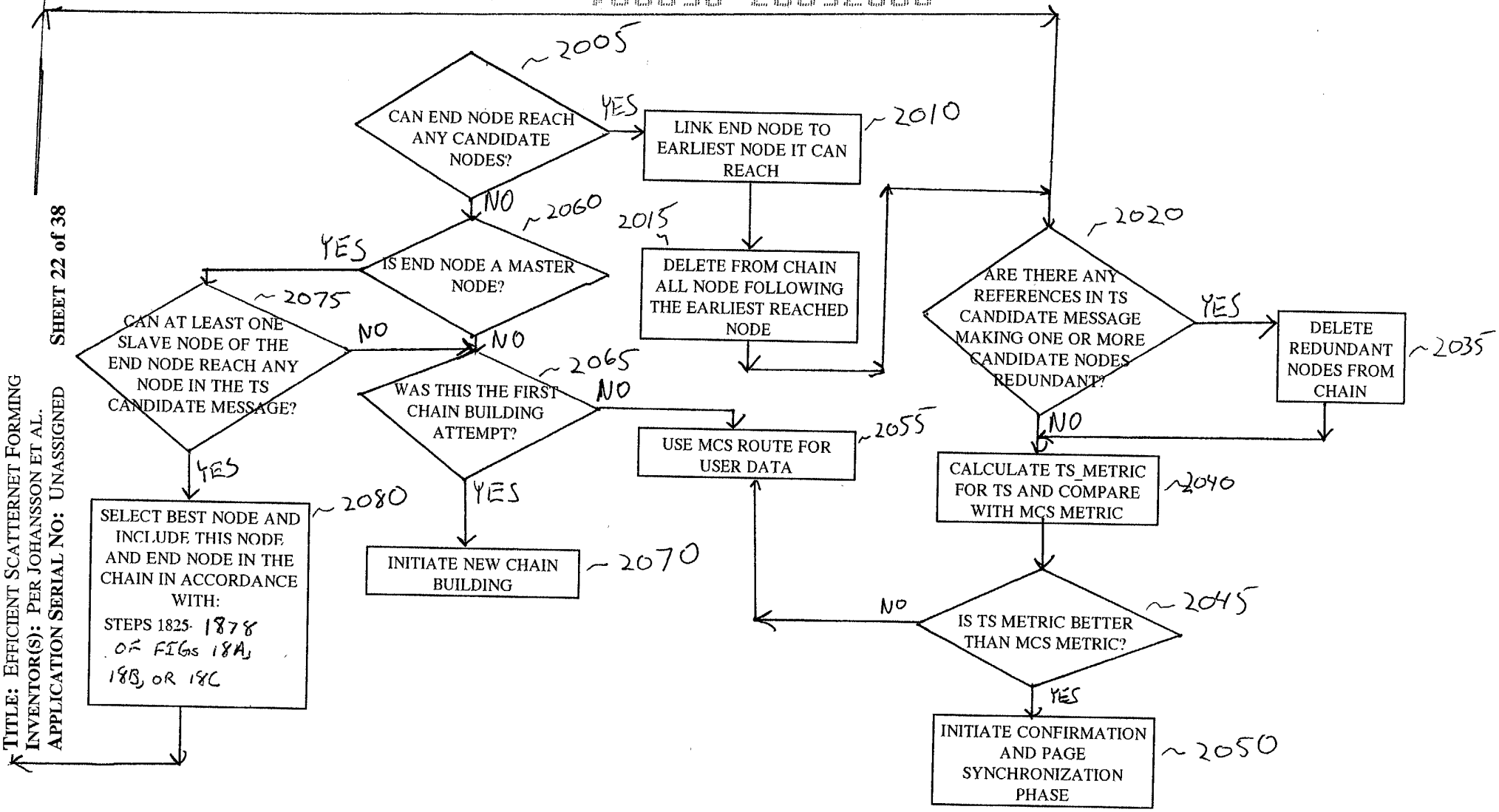


FIG 20

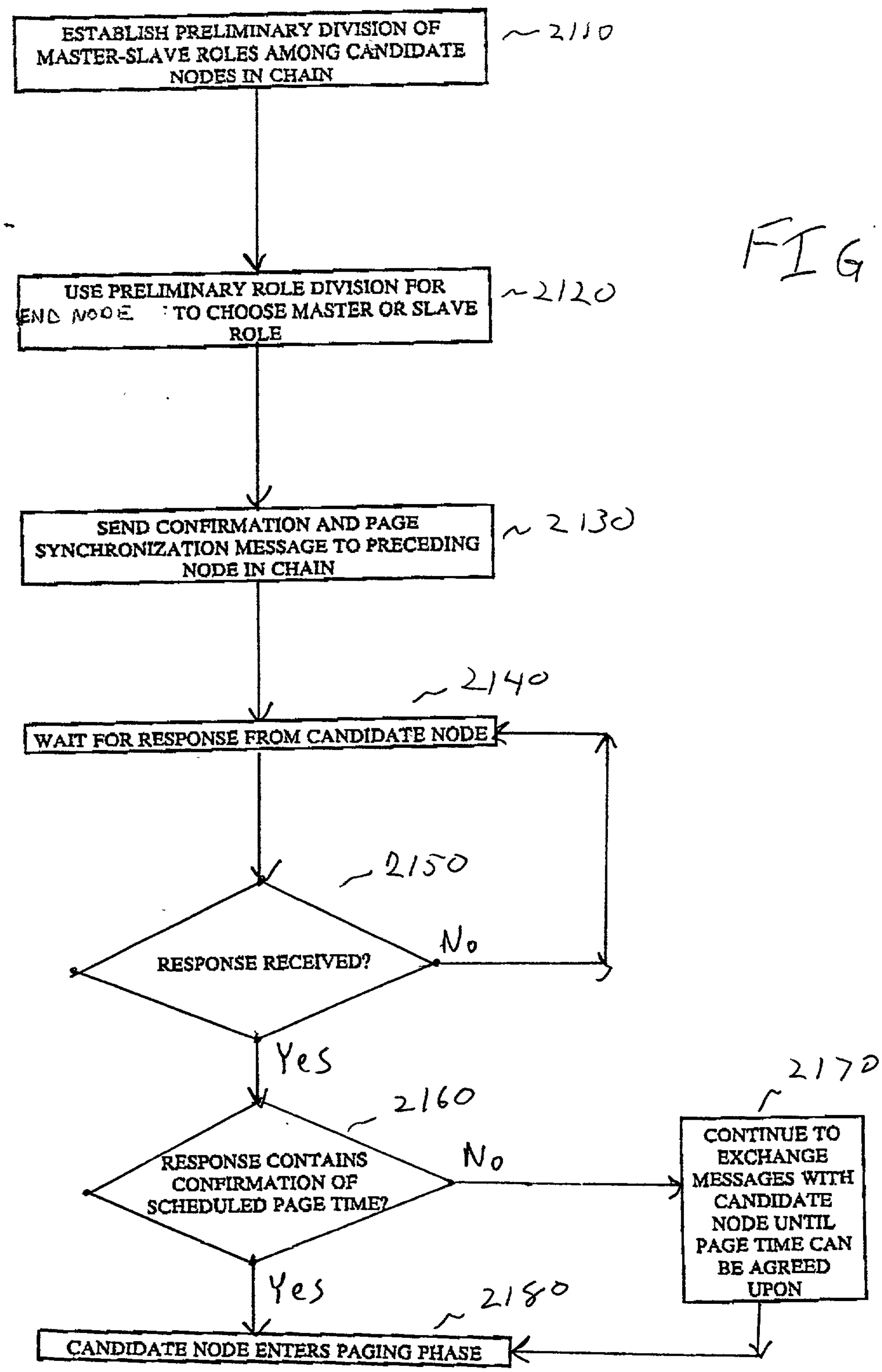

ESTABLISH PRELIMINARY DIVISION OF MASTER-SLAVE ROLES AMONG CANDIDATE NODES IN CHAIN
2110
USE PRELIMINARY ROLE DIVISION FOR END NODE TO CHOOSE MASTER OR SLAVE ROLE
2120
SEND CONFIRMATION AND PAGE SYNCHRONIZATION MESSAGE TO PRECEDING NODE IN CHAIN
2130
WAIT FOR RESPONSE FROM CANDIDATE NODE
2140
RESPONSE RECEIVED?
2150
No
Yes
RESPONSE CONTAINS CONFIRMATION OF SCHEDULED PAGE TIME?
2160
No
Yes
CONTINUE TO EXCHANGE MESSAGES WITH CANDIDATE NODE UNTIL PAGE TIME CAN BE AGREED UPON
2170
CANDIDATE NODE ENTERS PAGING PHASE
2180

FIG 21

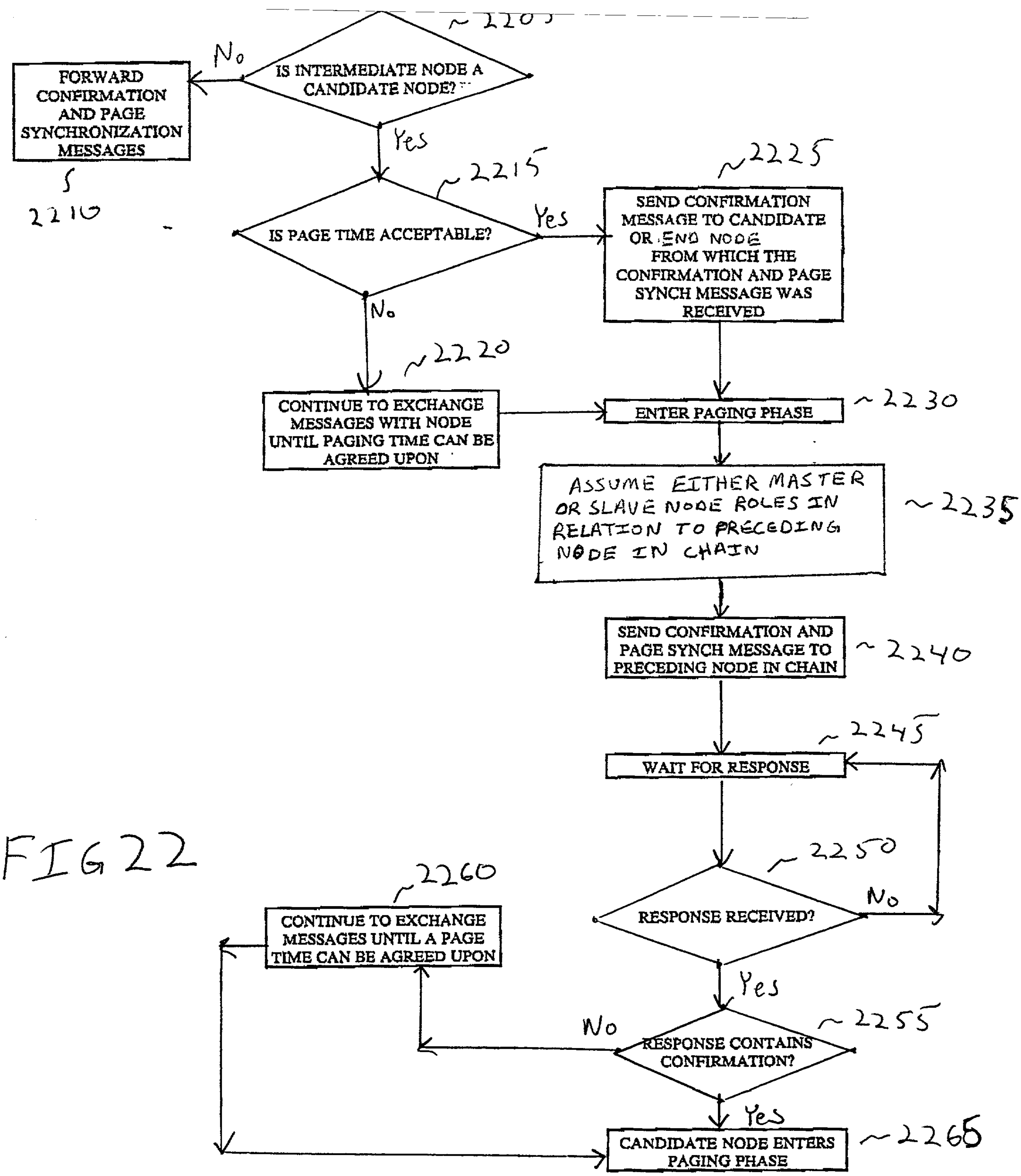

IS INTERMEDIATE NODE A CANDIDATE NODE?
No
Yes
FORWARD CONFIRMATION AND PAGE SYNCHRONIZATION MESSAGES
2210
2215
IS PAGE TIME ACCEPTABLE?
Yes
No
2225
SEND CONFIRMATION MESSAGE TO CANDIDATE OR END NODE FROM WHICH THE CONFIRMATION AND PAGE SYNCH MESSAGE WAS RECEIVED
2220
CONTINUE TO EXCHANGE MESSAGES WITH NODE UNTIL PAGING TIME CAN BE AGREED UPON
ENTER PAGING PHASE
2230
ASSUME EITHER MASTER OR SLAVE NODE ROLES IN RELATION TO PRECEDING NODE IN CHAIN
2235
SEND CONFIRMATION AND PAGE SYNCH MESSAGE TO PRECEDING NODE IN CHAIN
2240
2245
WAIT FOR RESPONSE
2250
RESPONSE RECEIVED?
No
Yes
2260
CONTINUE TO EXCHANGE MESSAGES UNTIL A PAGE TIME CAN BE AGREED UPON
No
RESPONSE CONTAINS CONFIRMATION?
2255
Yes
CANDIDATE NODE ENTERS PAGING PHASE
2265

FIG 22

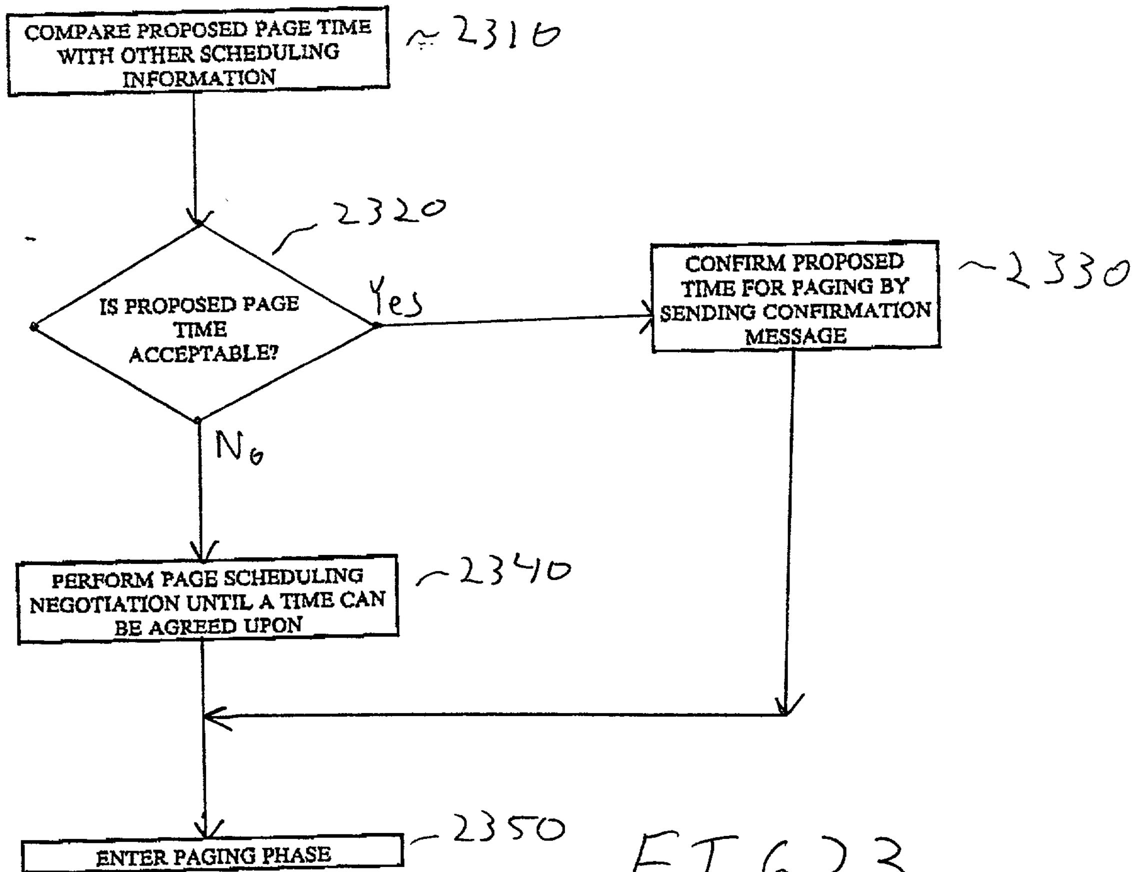


FIG 23

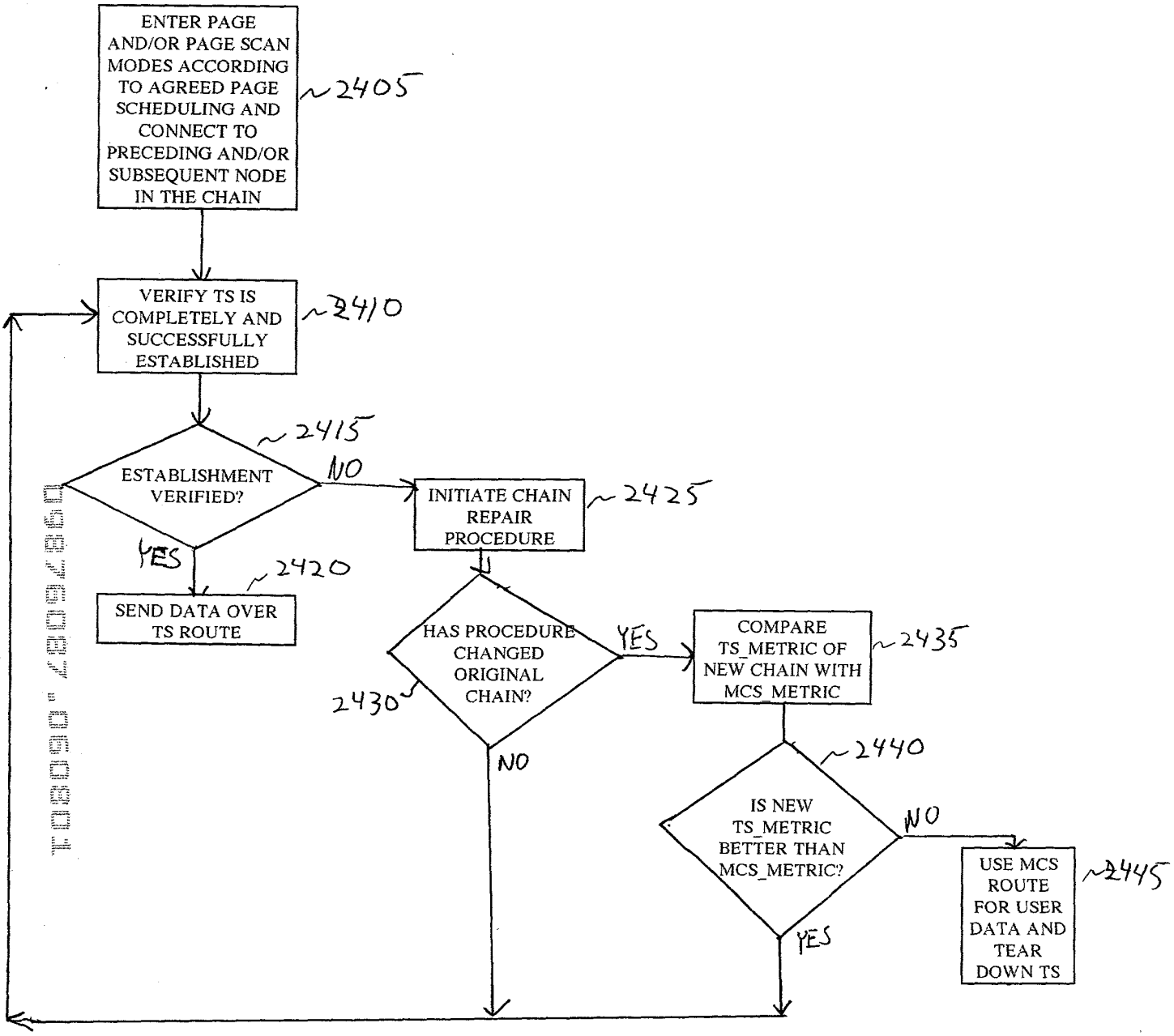

ENTER PAGE AND/OR PAGE SCAN MODES ACCORDING TO AGREED PAGE SCHEDULING AND CONNECT TO PRECEDING AND/OR SUBSEQUENT NODE IN THE CHAIN
2405
VERIFY TS IS COMPLETELY AND SUCCESSFULLY ESTABLISHED
2410
ESTABLISHMENT VERIFIED?
2415
NO
YES
INITIATE CHAIN REPAIR PROCEDURE
2425
SEND DATA OVER TS ROUTE
2420
HAS PROCEDURE CHANGED ORIGINAL CHAIN?
2430
YES
NO
COMPARE TS_METRIC OF NEW CHAIN WITH MCS_METRIC
2435
IS NEW TS_METRIC BETTER THAN MCS_METRIC?
2440
NO
YES
USE MCS ROUTE FOR USER DATA AND TEAR DOWN TS
2445

FIG 24

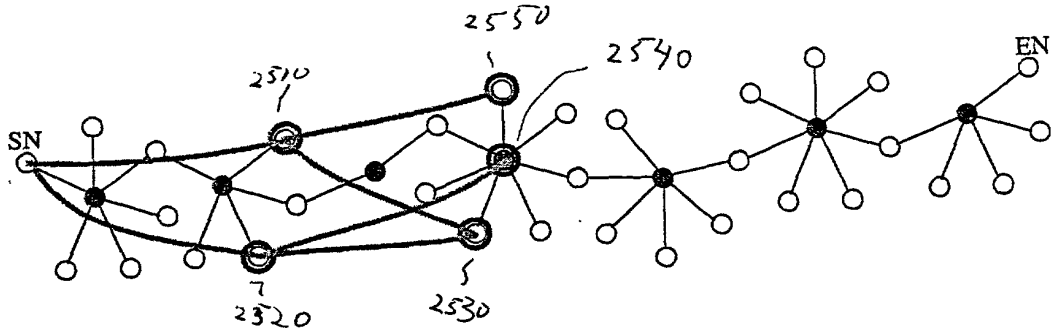


FIG 25A

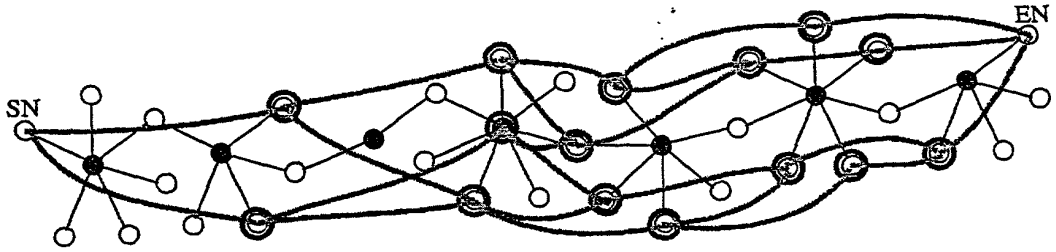


Fig 25B

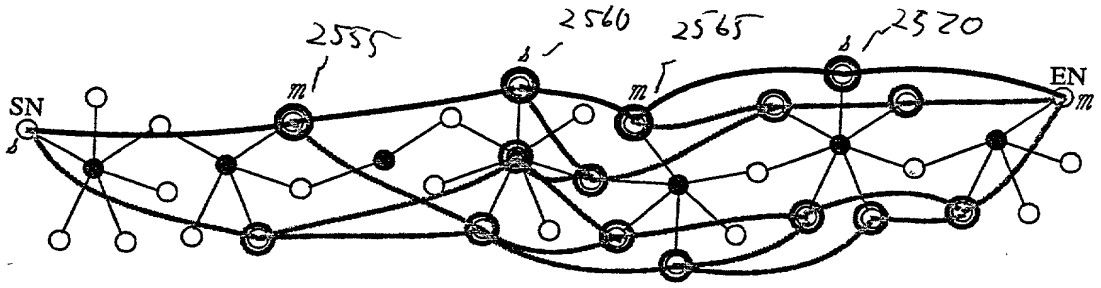


Fig 25C

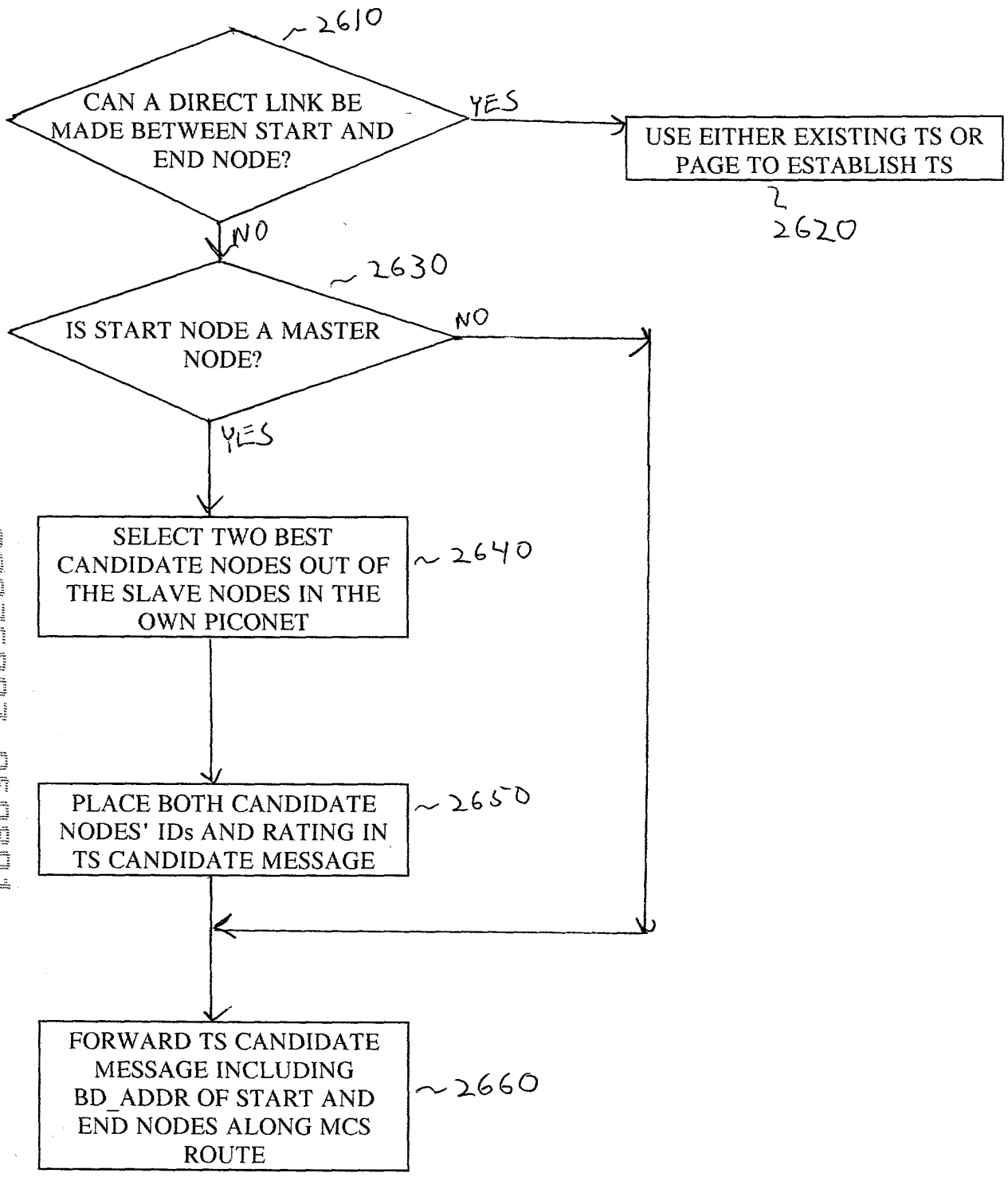

2610
CAN A DIRECT LINK BE MADE BETWEEN START AND END NODE?
YES
USE EITHER EXISTING TS OR PAGE TO ESTABLISH TS
2620
NO
2630
IS START NODE A MASTER NODE?
NO
YES
SELECT TWO BEST CANDIDATE NODES OUT OF THE SLAVE NODES IN THE OWN PICONET
2640
PLACE BOTH CANDIDATE NODES' IDs AND RATING IN TS CANDIDATE MESSAGE
2650
FORWARD TS CANDIDATE MESSAGE INCLUDING BD_ADDR OF START AND END NODES ALONG MCS ROUTE
2660

FIG 26

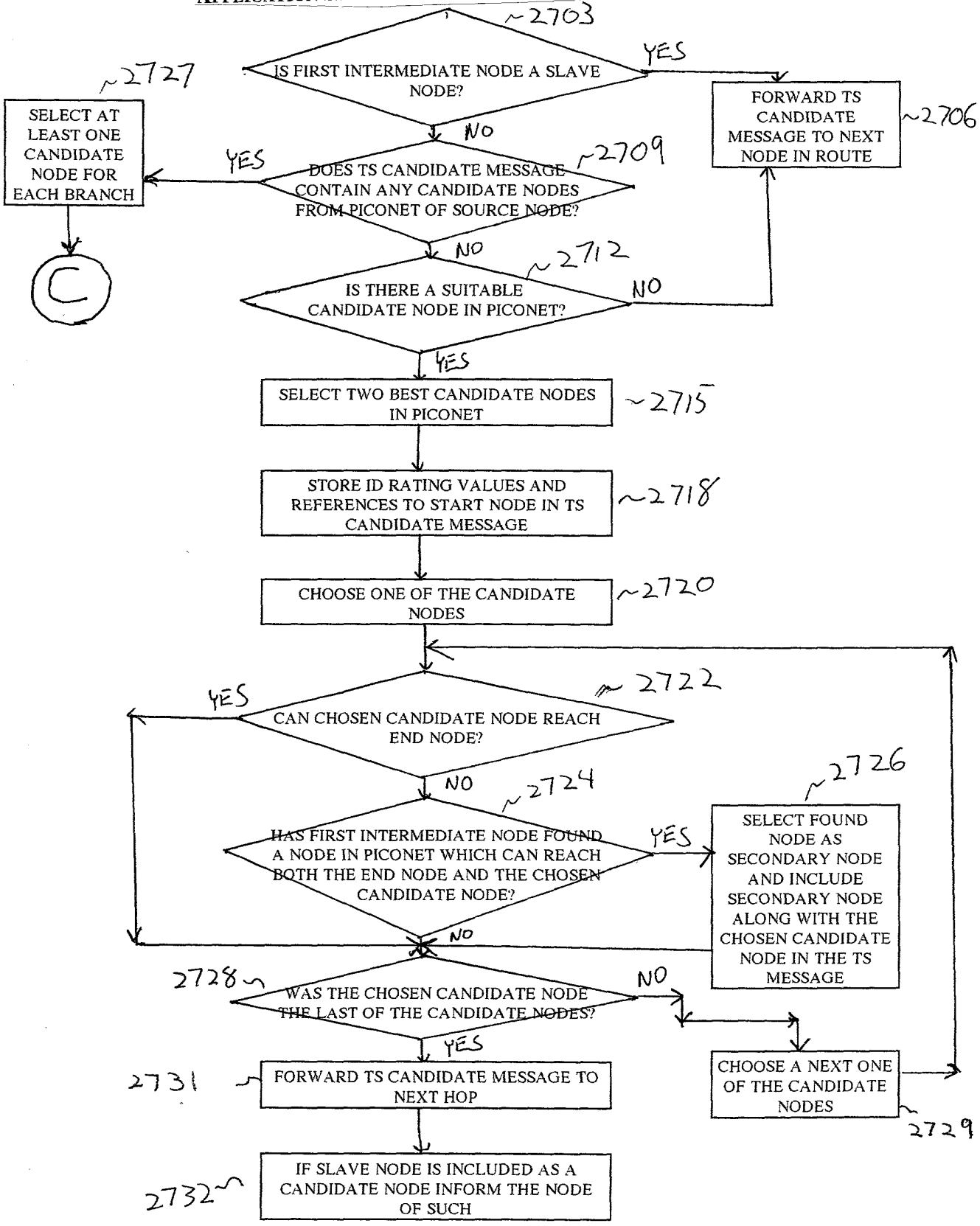

2703
IS FIRST INTERMEDIATE NODE A SLAVE NODE?
YES
NO
2706
FORWARD TS CANDIDATE MESSAGE TO NEXT NODE IN ROUTE
2709
DOES TS CANDIDATE MESSAGE CONTAIN ANY CANDIDATE NODES FROM PICONET OF SOURCE NODE?
YES
2727
SELECT AT LEAST ONE CANDIDATE NODE FOR EACH BRANCH
C
NO
2712
IS THERE A SUITABLE CANDIDATE NODE IN PICONET?
NO
YES
2715
SELECT TWO BEST CANDIDATE NODES IN PICONET
2718
STORE ID RATING VALUES AND REFERENCES TO START NODE IN TS CANDIDATE MESSAGE
2720
CHOOSE ONE OF THE CANDIDATE NODES
2722
CAN CHOSEN CANDIDATE NODE REACH END NODE?
YES
NO
2724
HAS FIRST INTERMEDIATE NODE FOUND A NODE IN PICONET WHICH CAN REACH BOTH THE END NODE AND THE CHOSEN CANDIDATE NODE?
YES
2726
SELECT FOUND NODE AS SECONDARY NODE AND INCLUDE SECONDARY NODE ALONG WITH THE CHOSEN CANDIDATE NODE IN THE TS MESSAGE
NO
2728
WAS THE CHOSEN CANDIDATE NODE THE LAST OF THE CANDIDATE NODES?
NO
YES
2731
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP
2729
CHOOSE A NEXT ONE OF THE CANDIDATE NODES
2732
IF SLAVE NODE IS INCLUDED AS A CANDIDATE NODE INFORM THE NODE OF SUCH

FIG 27A

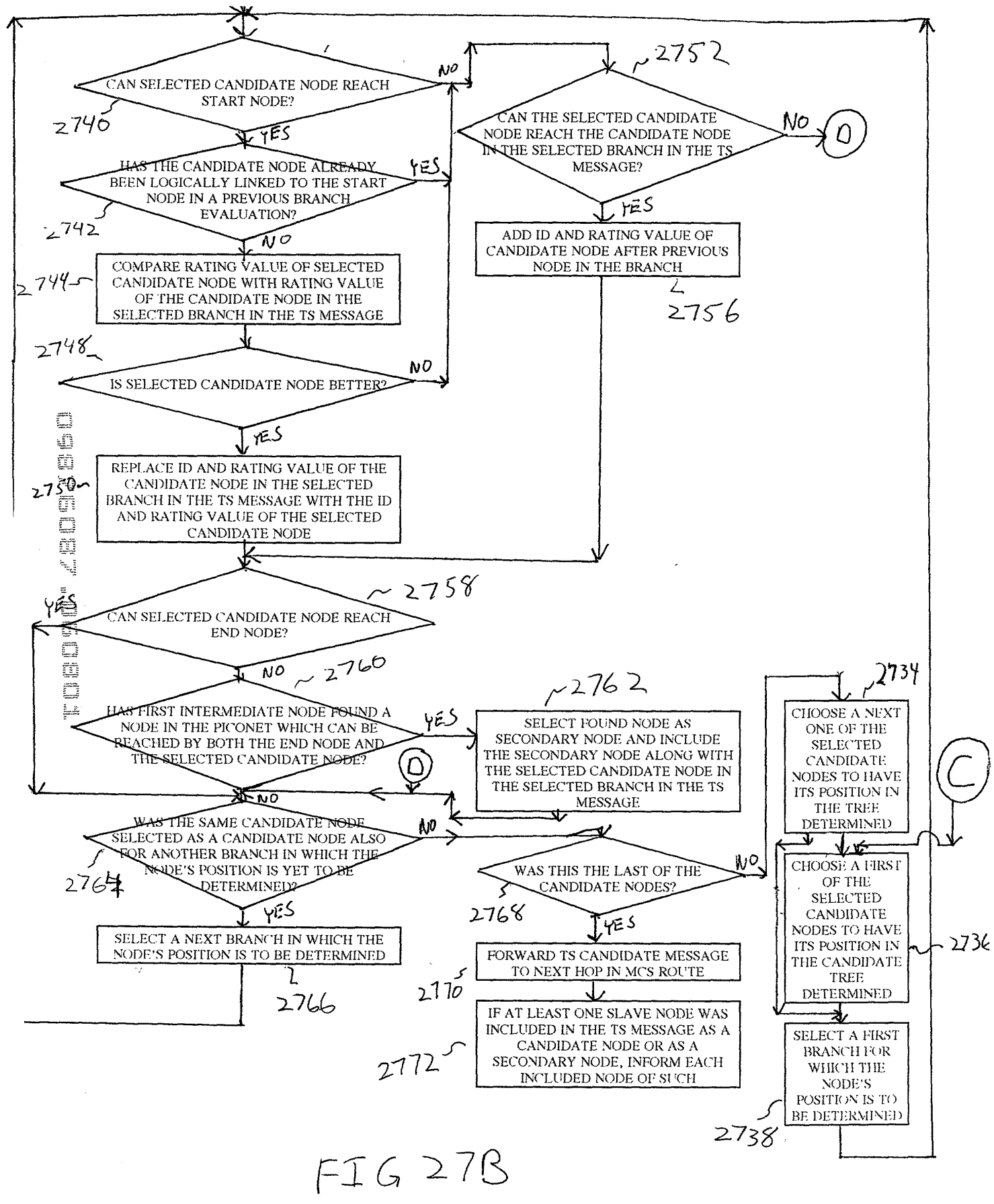

CAN SELECTED CANDIDATE NODE REACH START NODE?
2740
NO
YES
HAS THE CANDIDATE NODE ALREADY BEEN LOGICALLY LINKED TO THE START NODE IN A PREVIOUS BRANCH EVALUATION?
2742
YES
NO
COMPARE RATING VALUE OF SELECTED CANDIDATE NODE WITH RATING VALUE OF THE CANDIDATE NODE IN THE SELECTED BRANCH IN THE TS MESSAGE
2744
IS SELECTED CANDIDATE NODE BETTER?
2748
NO
YES
REPLACE ID AND RATING VALUE OF THE CANDIDATE NODE IN THE SELECTED BRANCH IN THE TS MESSAGE WITH THE ID AND RATING VALUE OF THE SELECTED CANDIDATE NODE
2750
CAN THE SELECTED CANDIDATE NODE REACH THE CANDIDATE NODE IN THE SELECTED BRANCH IN THE TS MESSAGE?
2752
NO
D
YES
ADD ID AND RATING VALUE OF CANDIDATE NODE AFTER PREVIOUS NODE IN THE BRANCH
2756
CAN SELECTED CANDIDATE NODE REACH END NODE?
2758
YES
NO
HAS FIRST INTERMEDIATE NODE FOUND A NODE IN THE PICONET WHICH CAN BE REACHED BY BOTH THE END NODE AND THE SELECTED CANDIDATE NODE?
2760
YES
SELECT FOUND NODE AS SECONDARY NODE AND INCLUDE THE SECONDARY NODE ALONG WITH THE SELECTED CANDIDATE NODE IN THE SELECTED BRANCH IN THE TS MESSAGE
2762
D
NO
WAS THE SAME CANDIDATE NODE SELECTED AS A CANDIDATE NODE ALSO FOR ANOTHER BRANCH IN WHICH THE NODE'S POSITION IS YET TO BE DETERMINED?
2764
NO
YES
SELECT A NEXT BRANCH IN WHICH THE NODE'S POSITION IS TO BE DETERMINED
2766
WAS THIS THE LAST OF THE CANDIDATE NODES?
2768
NO
YES
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP IN MC'S ROUTE
2770
IF AT LEAST ONE SLAVE NODE WAS INCLUDED IN THE TS MESSAGE AS A CANDIDATE NODE OR AS A SECONDARY NODE, INFORM EACH INCLUDED NODE OF SUCH
2772
2734
CHOOSE A NEXT ONE OF THE SELECTED CANDIDATE NODES TO HAVE ITS POSITION IN THE TREE DETERMINED
C
CHOOSE A FIRST OF THE SELECTED CANDIDATE NODES TO HAVE ITS POSITION IN THE CANDIDATE TREE DETERMINED
2736
SELECT A FIRST BRANCH FOR WHICH THE NODE'S POSITION IS TO BE DETERMINED
2738

FIG 27B

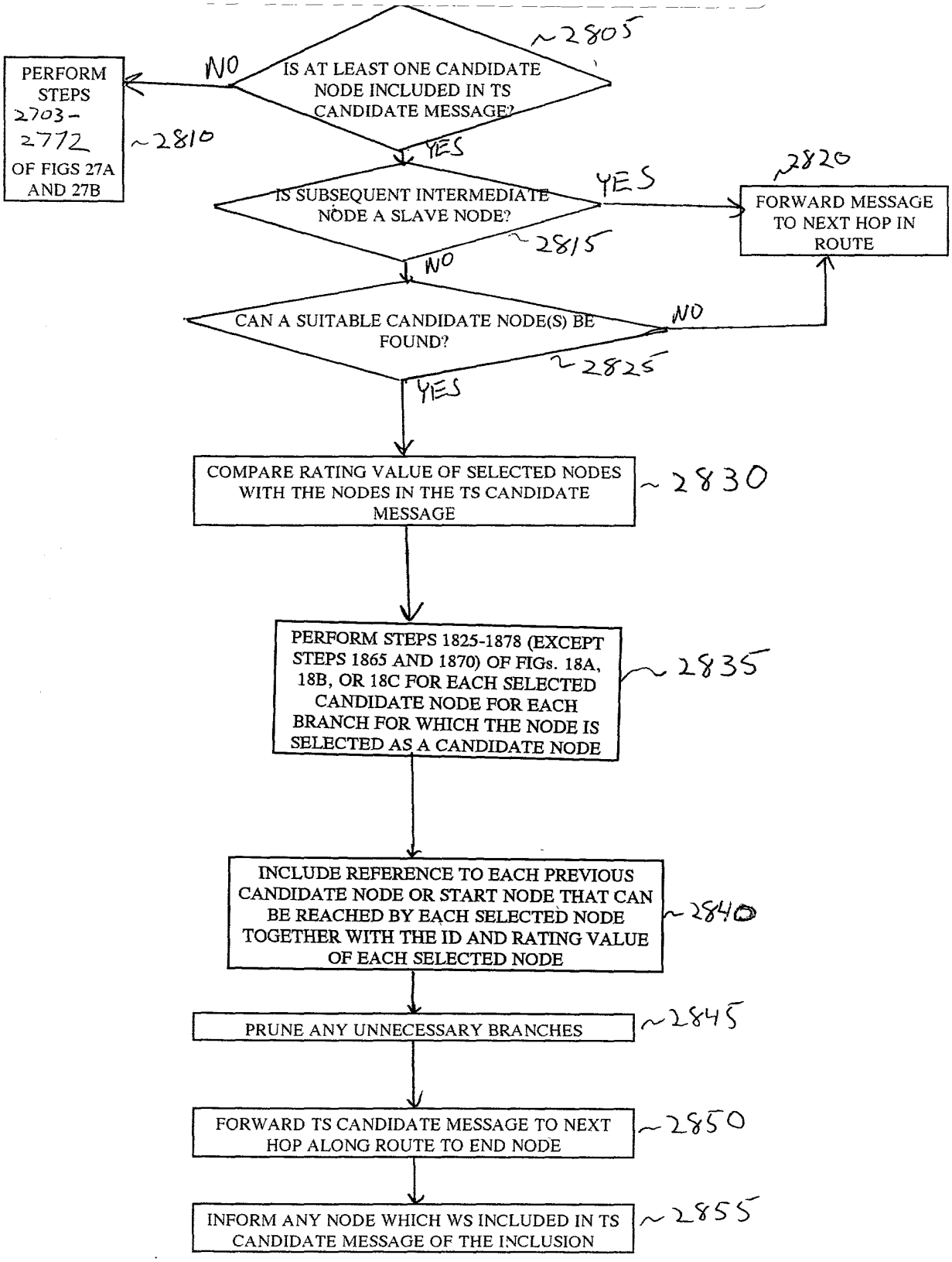

IS AT LEAST ONE CANDIDATE NODE INCLUDED IN TS CANDIDATE MESSAGE?
2805
NO
PERFORM STEPS 2703-2772 OF FIGS 27A AND 27B
2810
YES
IS SUBSEQUENT INTERMEDIATE NODE A SLAVE NODE?
YES
2820
FORWARD MESSAGE TO NEXT HOP IN ROUTE
2815
NO
CAN A SUITABLE CANDIDATE NODE(S) BE FOUND?
NO
2825
YES
COMPARE RATING VALUE OF SELECTED NODES WITH THE NODES IN THE TS CANDIDATE MESSAGE
2830
PERFORM STEPS 1825-1878 (EXCEPT STEPS 1865 AND 1870) OF FIGs. 18A, 18B, OR 18C FOR EACH SELECTED CANDIDATE NODE FOR EACH BRANCH FOR WHICH THE NODE IS SELECTED AS A CANDIDATE NODE
2835
INCLUDE REFERENCE TO EACH PREVIOUS CANDIDATE NODE OR START NODE THAT CAN BE REACHED BY EACH SELECTED NODE TOGETHER WITH THE ID AND RATING VALUE OF EACH SELECTED NODE
2840
PRUNE ANY UNNECESSARY BRANCHES
2845
FORWARD TS CANDIDATE MESSAGE TO NEXT HOP ALONG ROUTE TO END NODE
2850
INFORM ANY NODE WHICH WS INCLUDED IN TS CANDIDATE MESSAGE OF THE INCLUSION
2855

FIG 28

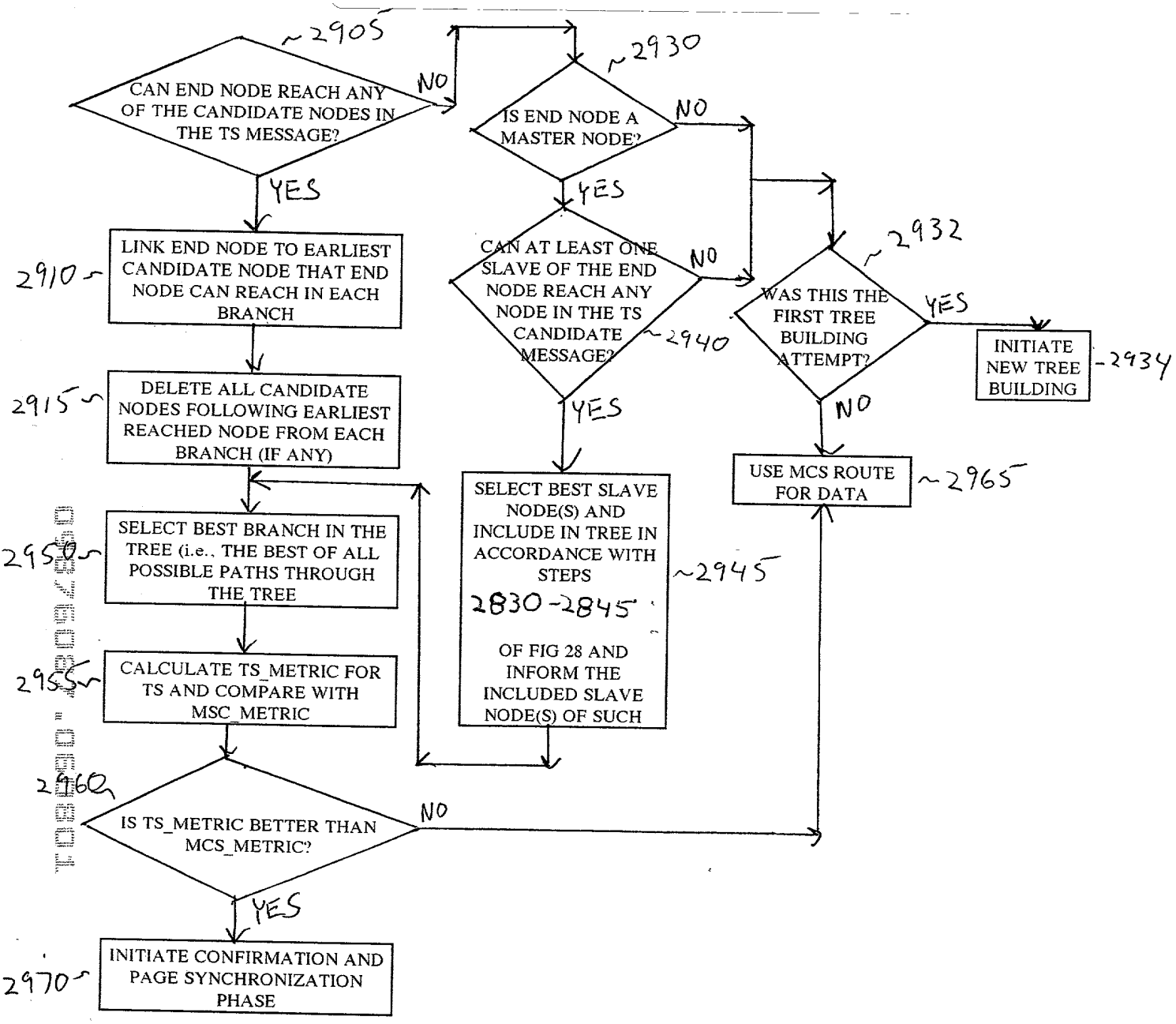

2905
CAN END NODE REACH ANY OF THE CANDIDATE NODES IN THE TS MESSAGE?
NO
YES
2910
LINK END NODE TO EARLIEST CANDIDATE NODE THAT END NODE CAN REACH IN EACH BRANCH
2915
DELETE ALL CANDIDATE NODES FOLLOWING EARLIEST REACHED NODE FROM EACH BRANCH (IF ANY)
2950
SELECT BEST BRANCH IN THE TREE (i.e., THE BEST OF ALL POSSIBLE PATHS THROUGH THE TREE
2955
CALCULATE TS_METRIC FOR TS AND COMPARE WITH MSC_METRIC
2960
IS TS_METRIC BETTER THAN MCS_METRIC?
NO
YES
2970
INITIATE CONFIRMATION AND PAGE SYNCHRONIZATION PHASE
2930
IS END NODE A MASTER NODE?
NO
YES
CAN AT LEAST ONE SLAVE OF THE END NODE REACH ANY NODE IN THE TS CANDIDATE MESSAGE?
2940
NO
YES
SELECT BEST SLAVE NODE(S) AND INCLUDE IN TREE IN ACCORDANCE WITH STEPS
2830-2845
OF FIG 28 AND INFORM THE INCLUDED SLAVE NODE(S) OF SUCH
2945
2932
WAS THIS THE FIRST TREE BUILDING ATTEMPT?
YES
NO
INITIATE NEW TREE BUILDING
2934
USE MCS ROUTE FOR DATA
2965

FIG 29

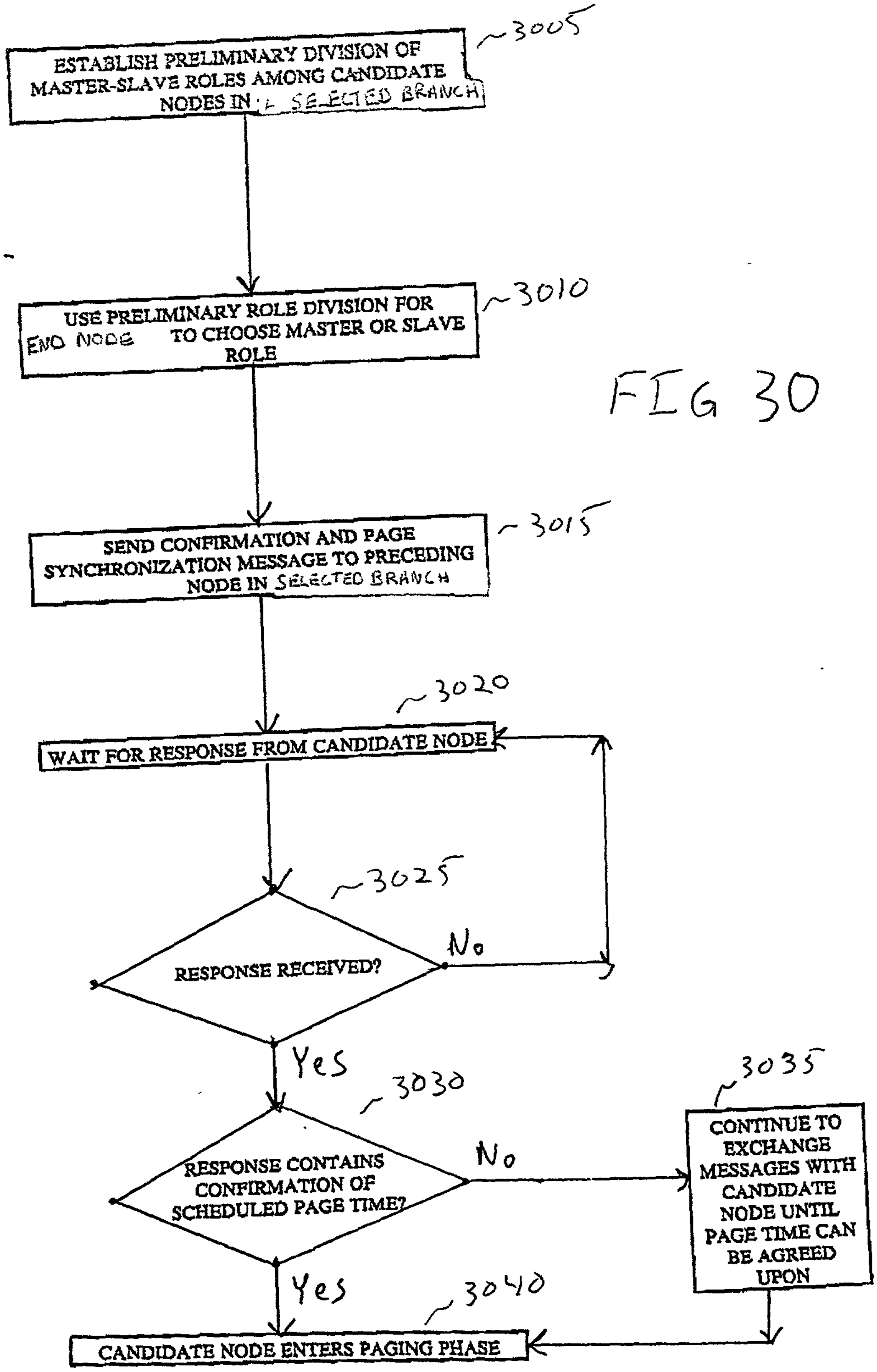

ESTABLISH PRELIMINARY DIVISION OF MASTER-SLAVE ROLES AMONG CANDIDATE NODES IN A SELECTED BRANCH
3005
USE PRELIMINARY ROLE DIVISION FOR END NODE TO CHOOSE MASTER OR SLAVE ROLE
3010
SEND CONFIRMATION AND PAGE SYNCHRONIZATION MESSAGE TO PRECEDING NODE IN SELECTED BRANCH
3015
3020
WAIT FOR RESPONSE FROM CANDIDATE NODE
3025
RESPONSE RECEIVED?
No
Yes
3030
RESPONSE CONTAINS CONFIRMATION OF SCHEDULED PAGE TIME?
No
3035
CONTINUE TO EXCHANGE MESSAGES WITH CANDIDATE NODE UNTIL PAGE TIME CAN BE AGREED UPON
Yes
3040
CANDIDATE NODE ENTERS PAGING PHASE

FIG 30

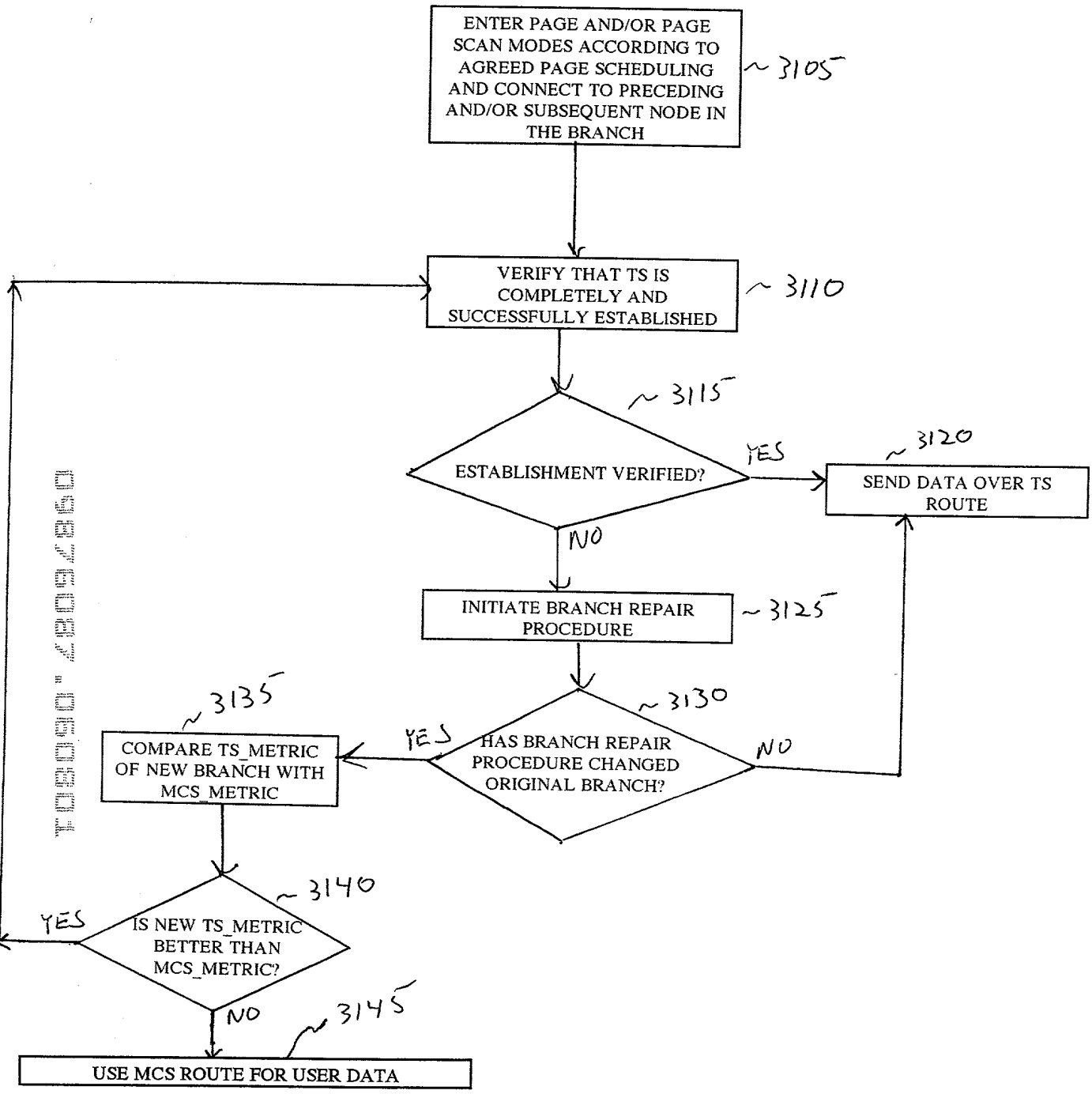
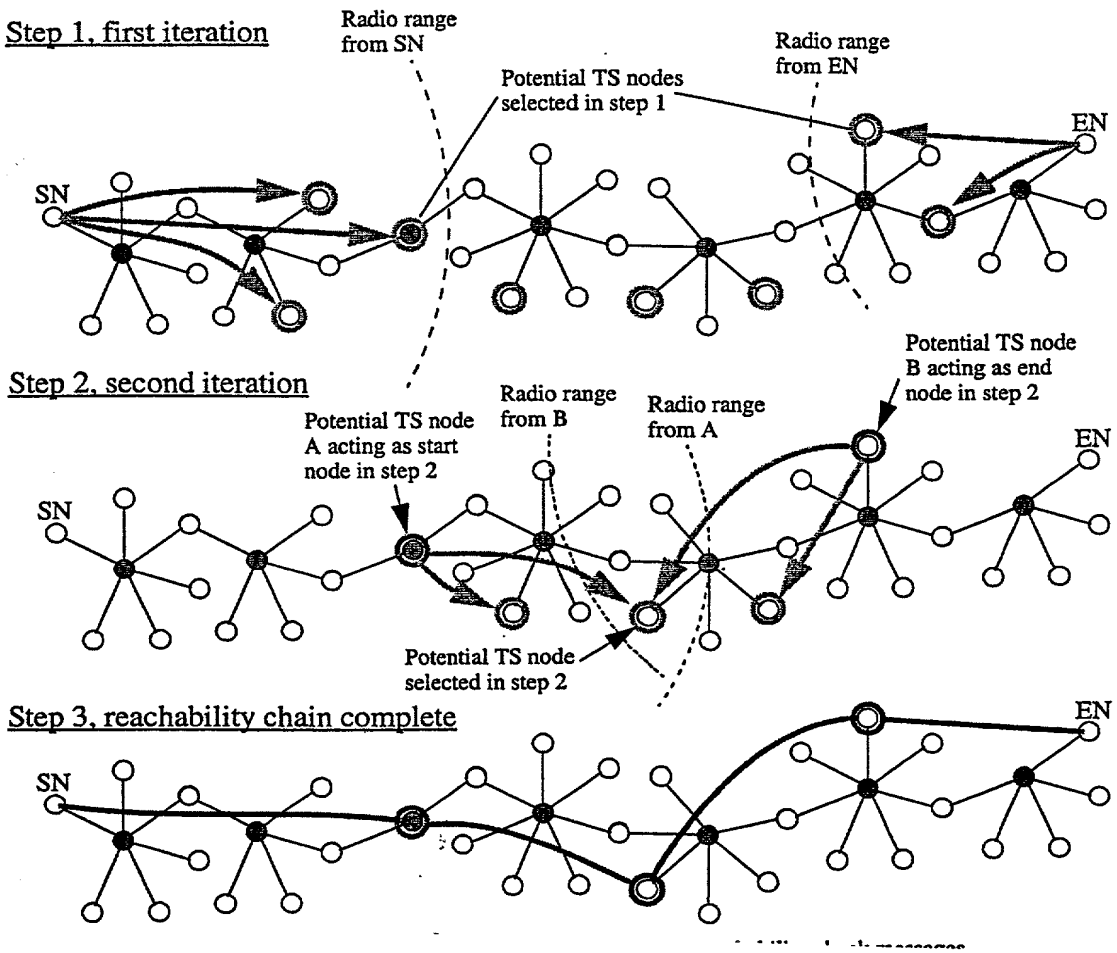

ENTER PAGE AND/OR PAGE SCAN MODES ACCORDING TO AGREED PAGE SCHEDULING AND CONNECT TO PRECEDING AND/OR SUBSEQUENT NODE IN THE BRANCH
3105
VERIFY THAT TS IS COMPLETELY AND SUCCESSFULLY ESTABLISHED
3110
3115
ESTABLISHMENT VERIFIED?
YES
3120
SEND DATA OVER TS ROUTE
NO
INITIATE BRANCH REPAIR PROCEDURE
3125
3130
HAS BRANCH REPAIR PROCEDURE CHANGED ORIGINAL BRANCH?
YES
NO
3135
COMPARE TS_METRIC OF NEW BRANCH WITH MCS_METRIC
3140
IS NEW TS_METRIC BETTER THAN MCS_METRIC?
YES
NO
3145
USE MCS ROUTE FOR USER DATA

FIG 31

32A


Step 1, first iteration
Radio range from SN
Potential TS nodes selected in step 1
Radio range from EN
SN
EN
Step 2, second iteration
Potential TS node A acting as start node in step 2
Radio range from B
Radio range from A
Potential TS node B acting as end node in step 2
SN
EN
Potential TS node selected in step 2
Step 3, reachability chain complete
SN
EN

32B

32C

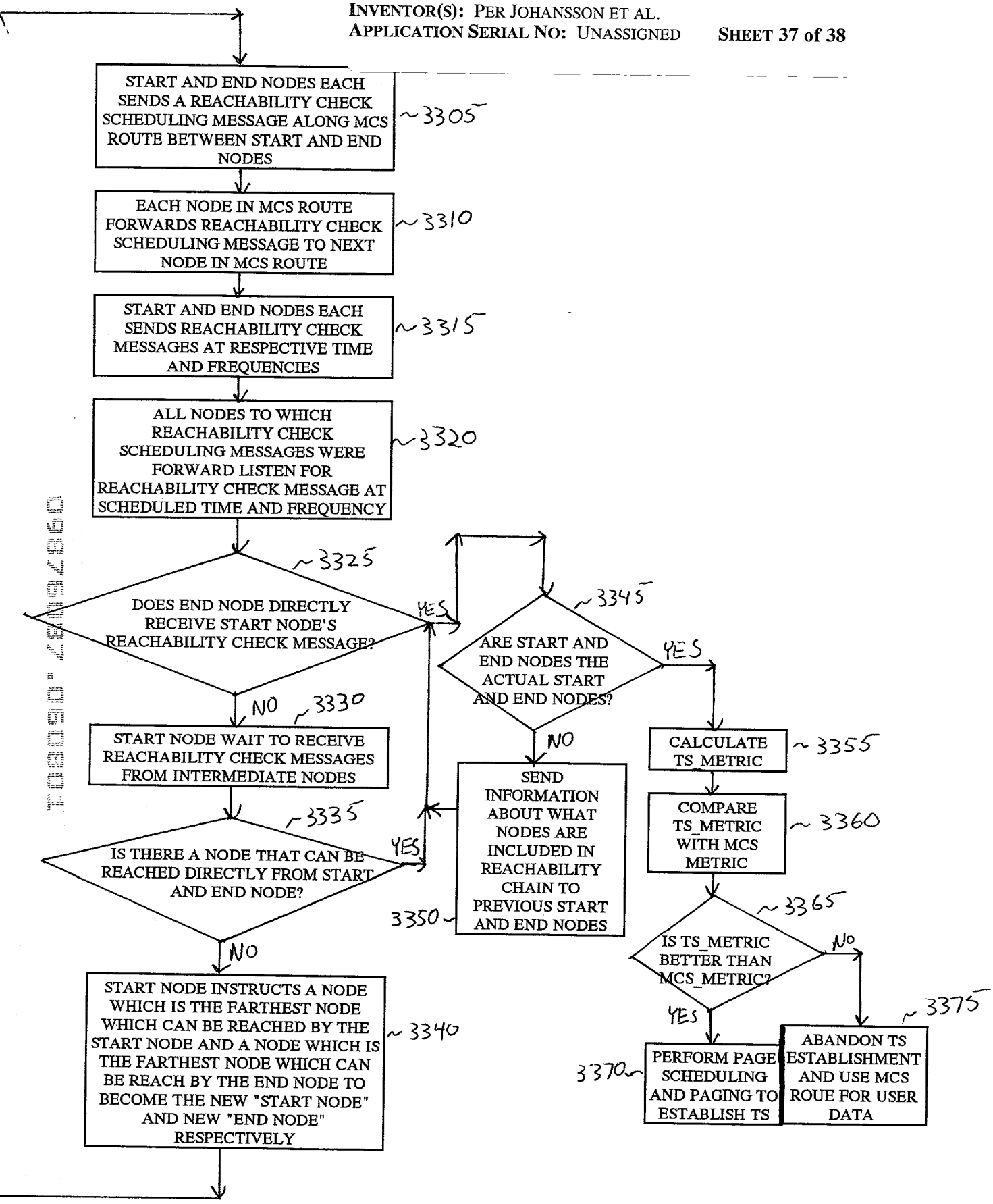

START AND END NODES EACH SENDS A REACHABILITY CHECK SCHEDULING MESSAGE ALONG MCS ROUTE BETWEEN START AND END NODES
3305
EACH NODE IN MCS ROUTE FORWARDS REACHABILITY CHECK SCHEDULING MESSAGE TO NEXT NODE IN MCS ROUTE
3310
START AND END NODES EACH SENDS REACHABILITY CHECK MESSAGES AT RESPECTIVE TIME AND FREQUENCIES
3315
ALL NODES TO WHICH REACHABILITY CHECK SCHEDULING MESSAGES WERE FORWARD LISTEN FOR REACHABILITY CHECK MESSAGE AT SCHEDULED TIME AND FREQUENCY
3320
3325
DOES END NODE DIRECTLY RECEIVE START NODE'S REACHABILITY CHECK MESSAGE?
YES
NO
3330
START NODE WAIT TO RECEIVE REACHABILITY CHECK MESSAGES FROM INTERMEDIATE NODES
3335
IS THERE A NODE THAT CAN BE REACHED DIRECTLY FROM START AND END NODE?
YES
NO
3340
START NODE INSTRUCTS A NODE WHICH IS THE FARTHEST NODE WHICH CAN BE REACHED BY THE START NODE AND A NODE WHICH IS THE FARTHEST NODE WHICH CAN BE REACH BY THE END NODE TO BECOME THE NEW "START NODE" AND NEW "END NODE" RESPECTIVELY
3345
ARE START AND END NODES THE ACTUAL START AND END NODES?
NO
YES
3350
SEND INFORMATION ABOUT WHAT NODES ARE INCLUDED IN REACHABILITY CHAIN TO PREVIOUS START AND END NODES
3355
CALCULATE TS_METRIC
3360
COMPARE TS_METRIC WITH MCS METRIC
3365
IS TS_METRIC BETTER THAN MCS_METRIC?
YES
No
3370
PERFORM PAGE SCHEDULING AND PAGING TO ESTABLISH TS
3375
ABANDON TS ESTABLISHMENT AND USE MCS ROUE FOR USER DATA

FIG 33

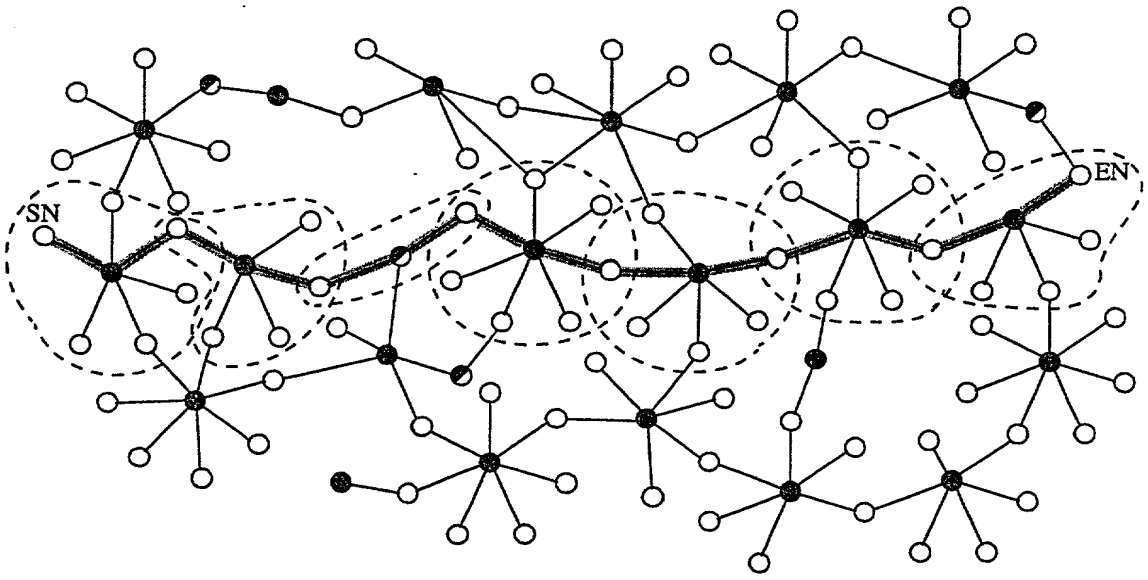


Fig 34